CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER
CHARLOTTENLUND SLOT – DANEMARK

ANNALES BIOLOGIQUES

VOLUME NO. III

RÉDIGÉ PAR
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The Areas and their Limits.
For the Transition Area see also the Map on p. 90.

North-Eastern Area.

The Arcto-Norwegian Stock of Cod.

By

Gunnar Rollefsen.

gth Measurements.

amples of skrei or Lofoten cod, i.e., the sexu- mature component of the Arcto-Norwegian of cod, have been taken every year since , and their length measured. These length urements have proved to be of very great im- nce for the understanding of the variations to h the size composition of the stock is subjected. resenting the frequency values of the measure- s in every single year as deviations from the value of the measurements taken throughout ies of years Oscar Sund could in a most ncing manner show the most outstanding peri- of recruitment. This is clearly demonstrated in re 1, where all measurements since 1913 are ff as deviations from the mean value of the urements 1913—1945.

When the work was started in 1913 we were rently in a period of strong recruitment. The nalyses carried out showed a strong group of r-old fish, i.e., fish born in 1904. In 1919 wave of recruitment was exhausted, but in same year the first faint signs of a new wave noticeable. Simultaneous age investigations that it is the year-class *1912* which makes ppearance.

n 1925 a new recruiting period sets in. This it is the three year-classes *1917*, *1918*, *1919* h appear in conjunction, and all three year- es are very numerous.

The next recruiting period, as we can clearly see, starts in 1937. It is mainly made up of the year-classes *1929* and *1930*. Finally we have the present period which started in 1944 when the year-class *1937* occurred in noticeable numbers.

Age Analyses.

Before 1932 the age analyses were made from fish scales, but since 1932 the reading of otoliths has been the basic method. The individual samples collected for age determination are comparatively large, and the picture we obtain of the development of the various year-classes gives a solid impression. Every year-class seems to have a regular fate.

In Figure 2 some heavy oblique lines are drawn so that we may follow a certain year-class through the different years. The oblique line in the middle traces the year-class *1930* through 10 years of its life, i.e., the time we have been able to follow it. This year-class occurs for the first time as 7-year-old skrei in 1937. It is the leading group of the stock in 1940. In 1943 it must resign the leadership to the year-classes *1933* and *1934*, both of which are above average. But they in turn are considerably outnumbered by the strong year-class of 1937 which dominates the stock from 1946 onwards. And we must expect that the year-class 1937 will continue to dominate during some years to come.

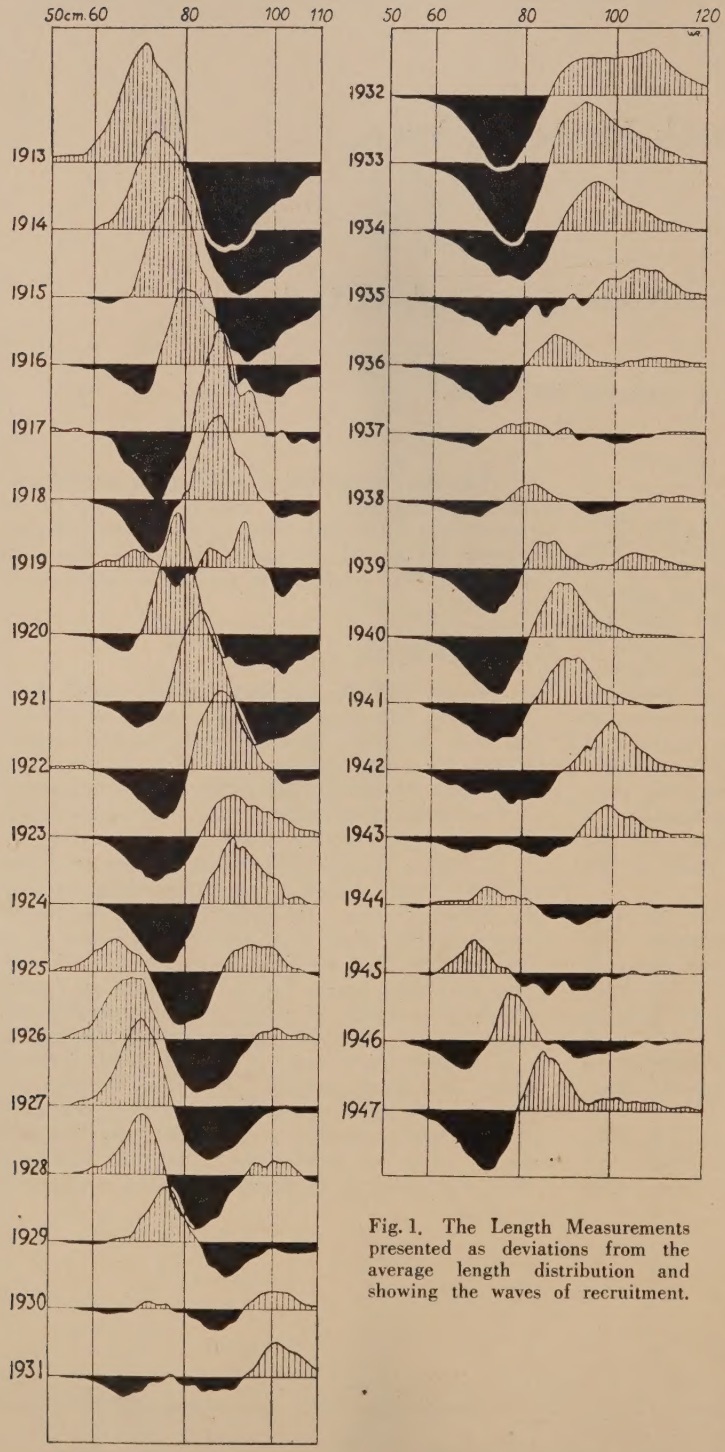


Fig. 1. The Length Measurements presented as deviations from the average length distribution and showing the waves of recruitment.

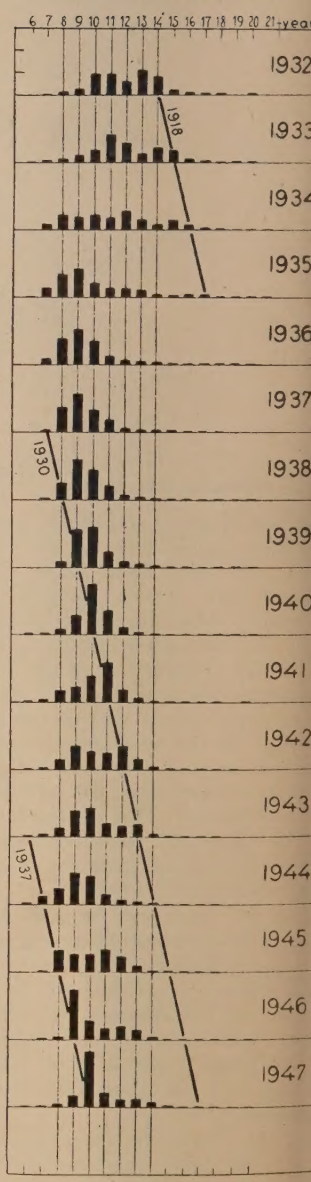


Fig. 2. The Age Distribution of Skrei.

North-Western Area.

INTRODUCTION.

THIS year again, reports from members of the committee are characterised by the lack of continuous field research in the remote thern waters, difficulties in obtaining adequately ipped research vessels and also by shortages of sonnel, laboratory facilities, gear and instruits. Obviously it will take several years before mal procedure is attained. Most of the members the North-Western Area Committee refer to one more of these difficulties as the immediate cause their inability to contribute to the year's report. lack of skilled personnel seems to be partiarly serious.

As a result of the above, our knowledge of the composition, strength of the various year broods, wth-rates, etc., for the stocks of almost all fish he North-Western Area is at present negligible. bright side in the situation is however evident from remarks made by various members, pointing out that they have obtained material on some stocks of important fishes, during the war and the post-war period. This material is to be worked up later, when time permits and more personnel is available.

Our knowledge of the physical factors affecting fish and other marine organisms is regrettably low, since practically no observations have been made during six years.

As seen from this report the routine work in the area was recommenced in 1946; and Mr. Jens Smed has continued his useful retrospect of monthly anomalies of the surface temperature in the North Atlantic.

At present it is, however, impossible to furnish particulars on the actual general conditions regarding stocks of fish, plankton and hydrography in the North-Western Area.

Å. V. Tåning.

HYDROGRAPHY.

Hydrographic Conditions in the Faroe-Shetland Channel in August 1

By

Jens Smed.

DURING August 26th and 27th, 1946, the Danish research vessel "Dana" under the leadership of Dr. Å. Vedel Tåning undertook hydrographic investigations along a section across the Faroe—Shetland channel (see Fig. 1). The data will be published in the *Bulletin Hydrographique pour les années 1940—1946.* A section showing isotherms and isohalines is given in Fig. 2. The positions of the stations are marked by vertical lines. Above each such line is indicated the number of the station, its position and the date when it was worked.

For an account of the normal conditions in the Faroe—Shetland channel the reader should refer to the investigation by Jacobsen (1943), where the section here in question is designated "Section II". The paper gives *inter alia* the mean conditions in this section for the latter three quarters of the year.

On the basis of the temperature and salinity data illustrated by Fig. 2 dynamical calculations were carried out in order to find the current velocity and the water transport through the section. The values of the velocity perpendicular to the section are given in the diagram Fig. 3 for the various intervals of depth between the stations. Positive values indicate that the current has a northerly direction. The values are based on the supposition that the zero-surface — i.e. the surface where the horizontal pressure gradient equals zero — for an interval between two stations is situated as shown by the bottom line of the interval in the diagram. That means that the zero-surface for the interval is supposed to coincide with the isobaric surface at the bottom of the station with the smallest depth.

Just below the bottom line in Fig. 3 are for

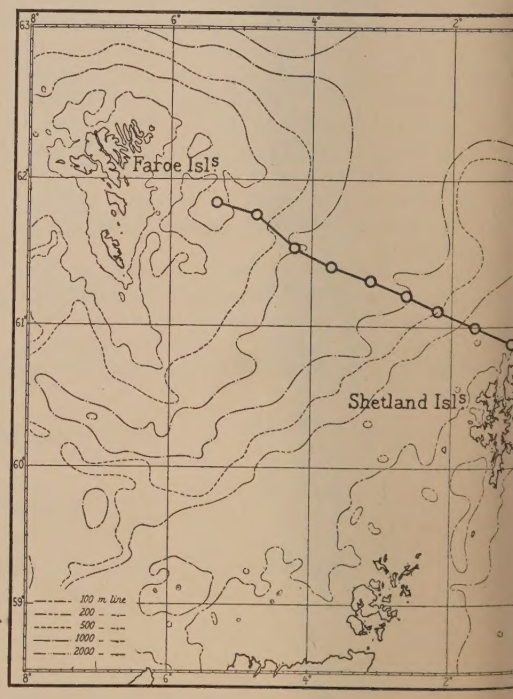


Fig. 1. Location of stations.

each interval recorded two values for the inten of the water flow through each interval in quest The upper one is in accordance with the stated rent velocities. The lower value is found from supposition (Jacobsen, loc. cit.) that the z surface coincides with the isobaric surface at 80

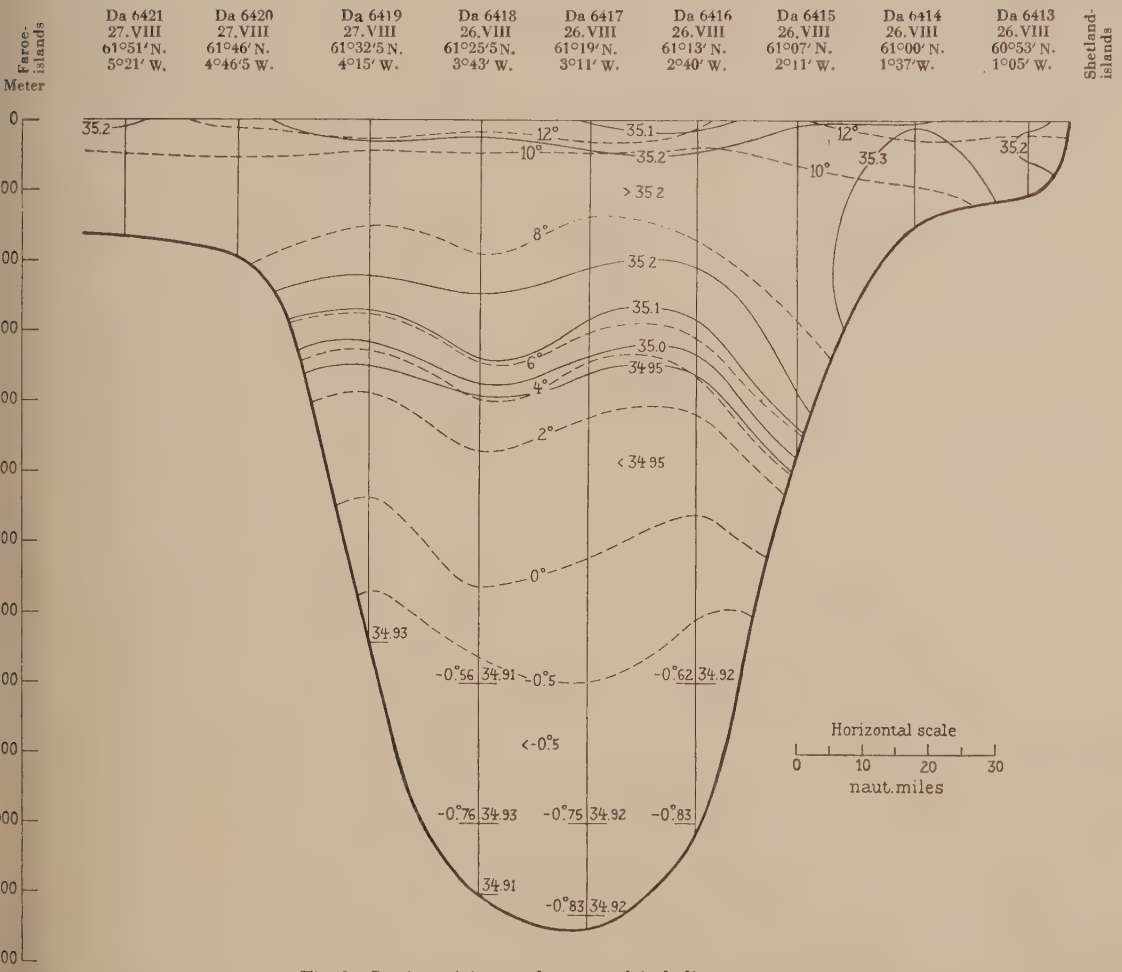


Fig. 2. Section giving isotherms and isohalines.

, with the bottom for depths less than 800 m. value for the interval between the stations Da 5 and Da 6416 is strongly influenced by the supposition.

It is seen from Fig. 3 that the main inflow takes e in the south-eastern part of the channel. This general feature. The figure shows that during time of the investigation an inflow also took e in the western part of the channel, whereas e was an outflow in the middle of the channel. The two values for the flow through the whole ion are recorded under "Total" in Fig. 3. Evi-ly the lower value should be regarded as the e accurate. This value too should, however, be n with some reserve as it is rather uncertain if m. is the actual depth of the zero-surface. On the other hand the value may be thought to give at least the correct order of magnitude of the inflow.

As to the current velocity, the correction involved by the new zero-surface is only of real importance in the interval Da 6415 to Da 6416. In this interval the velocity values indicated in Fig. 2 should be augmented by about 17 cm./sec. to be in accordance with the new supposition as to depth of the zero-surface.

Literature.

Bulletin Hydrographique pour les années 1940—1946. In preparation.

Jacobsen 1943. Rapp. et Proc.-Verb. CXII, p. 5.

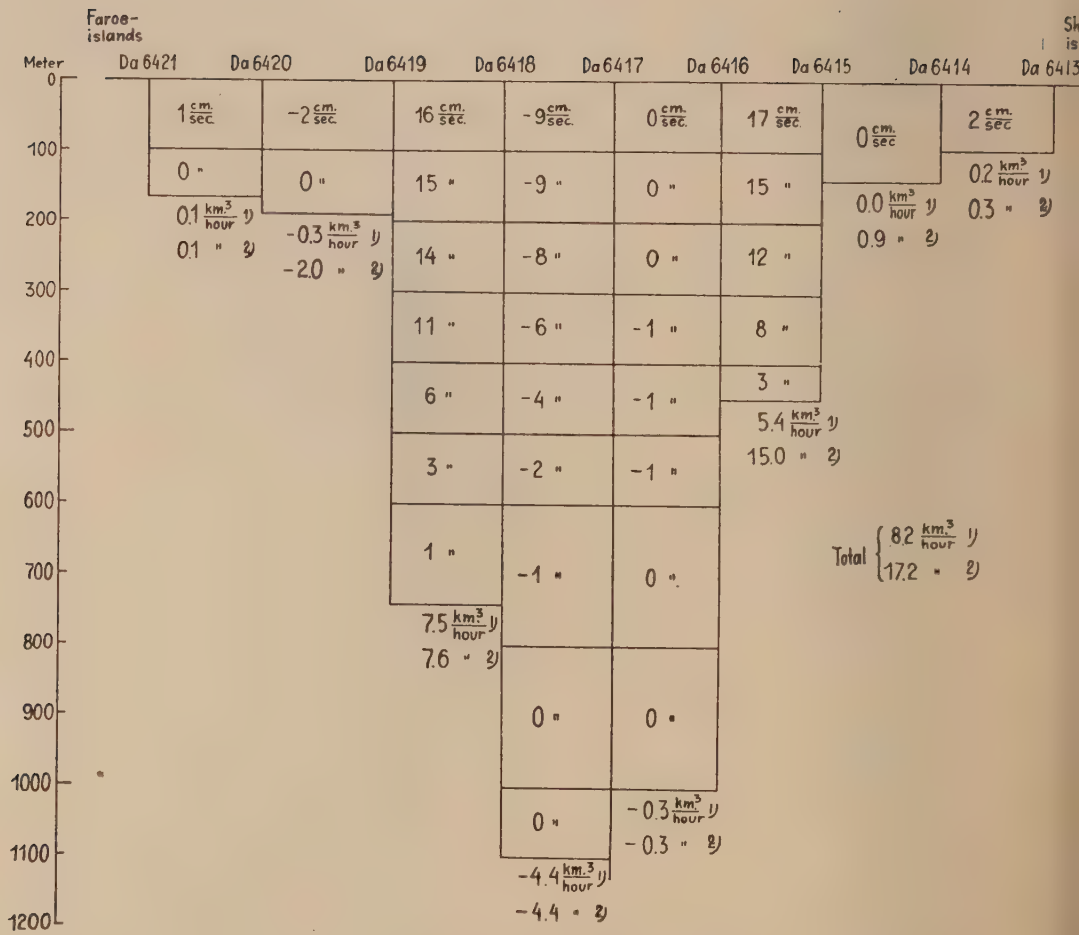


Fig. 3. Current and intensity of flow through the various parts of the section.
The figures marked 1) are the uncorrected, the figures marked 2) the corrected values.

Monthly Anomalies of the Surface Temperature in some Areas of the North-Western North Atlantic in 1876—1939 and 1945—1946

By

Jens Smed.

AS it may be of interest to the fishery biologist to know the variation of the temperature in an area during a period of some length, the following survey is given of the surface temperatures in some areas of the north-western North Atlantic during the years 1876—1939.

The material has been collected by the Da Meteorological Institute from vessels crossing North Atlantic. For the period 1912—1939 material was published in the relevant issue the *Nautisk-Meteorologisk Aarbog* as means fo various 1°-squares. These means have been

ectly in the present investigation. For the period 76—1911 monthly means were most kindly ced at our disposal by Helge Thomsen, ad of the Nautical Section of the Danish Me- rological Institute.

The procedure in working up the material was following. The temperature anomaly for each square and for each month was computed on the is of the monthly mean values for the period 76—1915, published by Ryder (1917). Then anomalies were averaged over the areas C, D 1 E shown in Fig. 1, viz. C: 60°—66° N., 30°— W.; D: 55°—60°N., 30°—40° W. and E: 50 55° N., 30°—50° W. By this averaging due ard was taken to the weight — indicated by the nber of observations — of the means for each square. For further details concerning the ocedure the reader is referred to an earlier paper med, 1947).

In Tables 1, 2 and 3 respectively are recorded resulting average anomalies (Δ) for the areas D and E as well as the numbers (n) of observa- ns on which these average anomalies are based[1]). area C the material contained no observations m the months January and February. A graphi- representation of these anomalies for the areas and D is given in Fig. 2, for area E in Fig. 3. Fig. 2 shows a high degree of conformity ween the variations in the surface temperature the areas C and D. Rather conspicuous is the dominance of positive anomalies in these areas the 1930's and — to a minor degree — in the 0's. Obviously the increase in the surface tem- ature which is known to have occurred at many er localities also appears in these waters. For a E (see Fig. 3), however, the increase in tem- ature is in any case not very pronounced.

For the areas A: 55°—70° N., 50°—58° W. B: 55°—63° N., 40°—50° W. (see Fig. 1.) the rease in temperature was studied in a previous per (Smed, loc. cit.), where monthly mean malies for each of these areas were given in les. A graphical representation of the results s given with special regard to the possibility of owing the variation of temperature from year year for each month separately. For the marine biology it may, however, be of use also to have a graph giving directly the variation of the temperature anomaly from month to month comparable with Figs. 2 and 3 above. It was, therefore, found

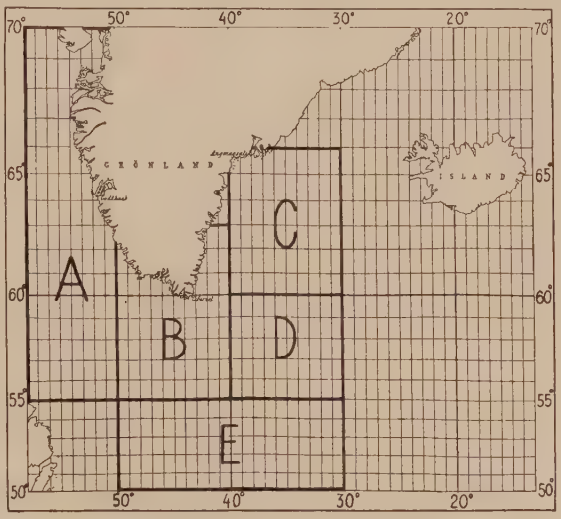


Fig. 1. Location of the areas considered.

advisable to give an analogous representation of the results for the areas A and B. This is done in Fig. 4. For further discussion of these results the reader is referred to the paper cited.

Unfortunately no observations from the war years are at disposal. For the last half of 1945 and for 1946, however, some observations are published in the *Nautisk-Meteorologisk Aarbog*. On the basis of these observations we have computed monthly mean anomalies for the areas A, B, C, D and E. The results are recorded in Table 4.

Literature.

Nautisk Meteorologisk Aarbog (Naut.-Meteor. Annual) 1912—1939, 1945—1946. København 1913—1940, 1946—1947.

Ryder 1917. Monthly Mean Temperatures of the Surface Water in the Atlantic, North of 50° N. Lat. (App. to Naut.-Meteor. Annual). Copenhagen.

Smed 1947. Annales Biologiques II, p. 17.

[1]) The figures relating to the period 1876—85 have been ted from Table 1.

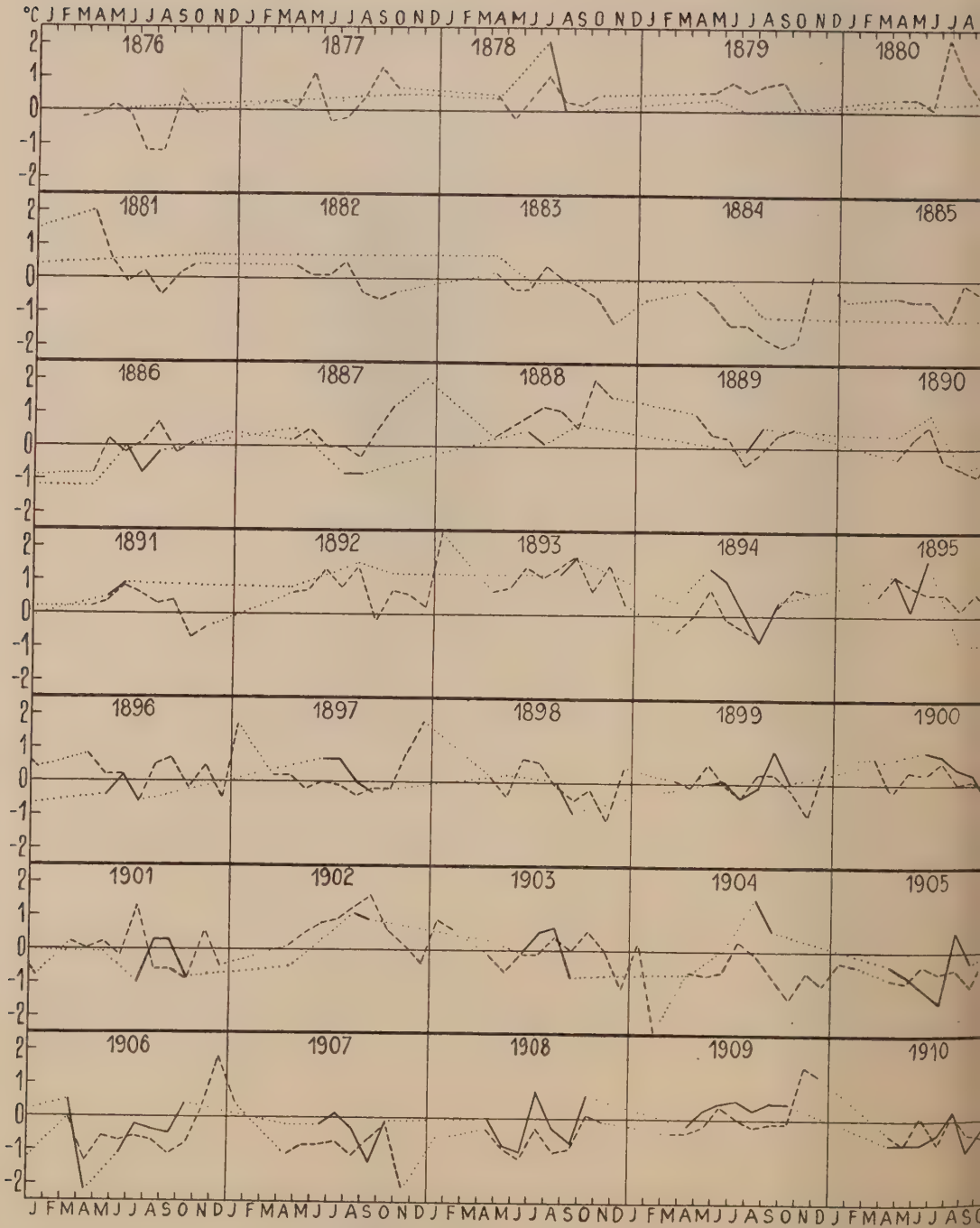
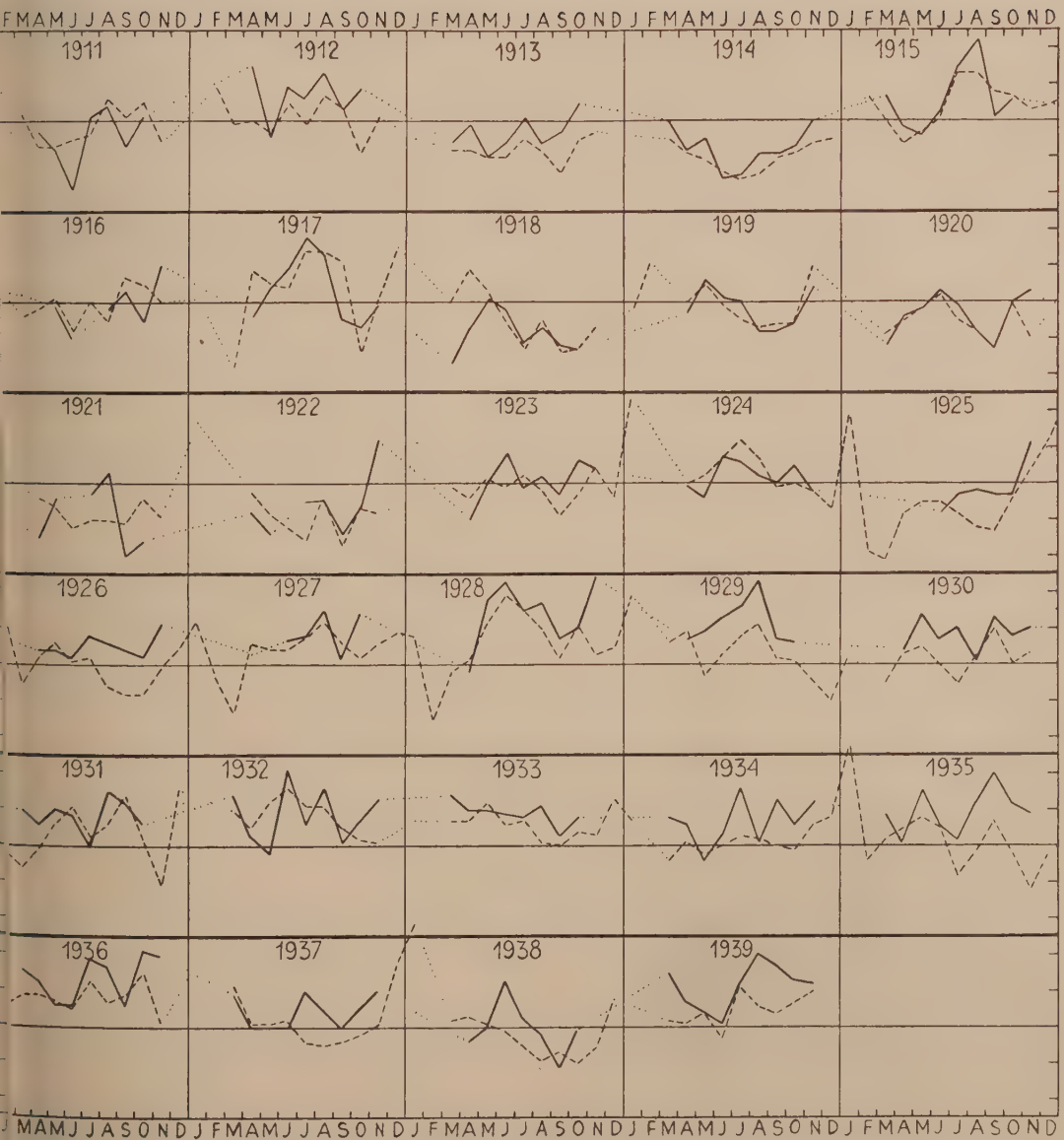


Fig. 2. Monthly anomalies of the surface temperature in the areas C and D (see F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the years 1876—1939. Solid lines: area C; dashed lines: area D.

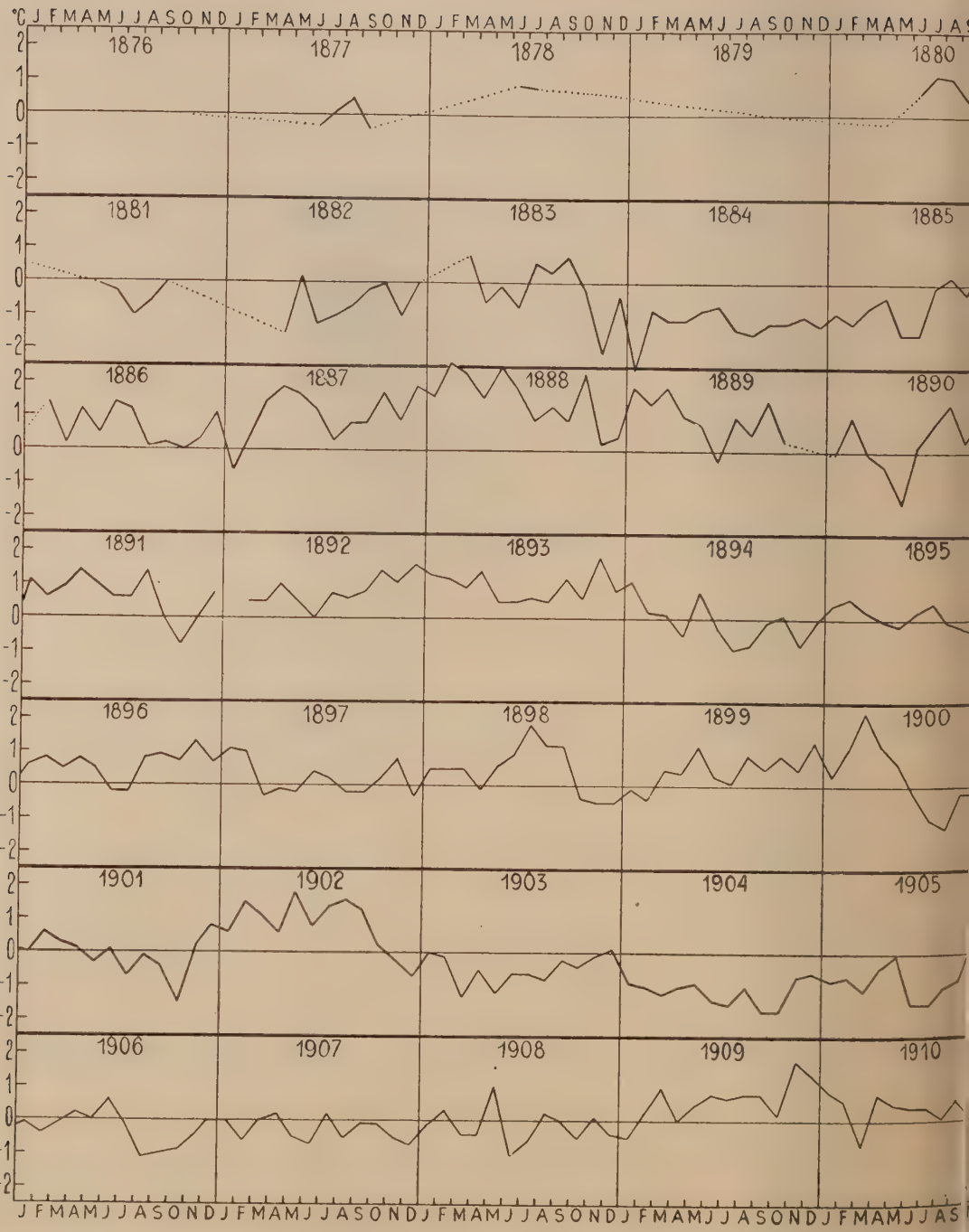
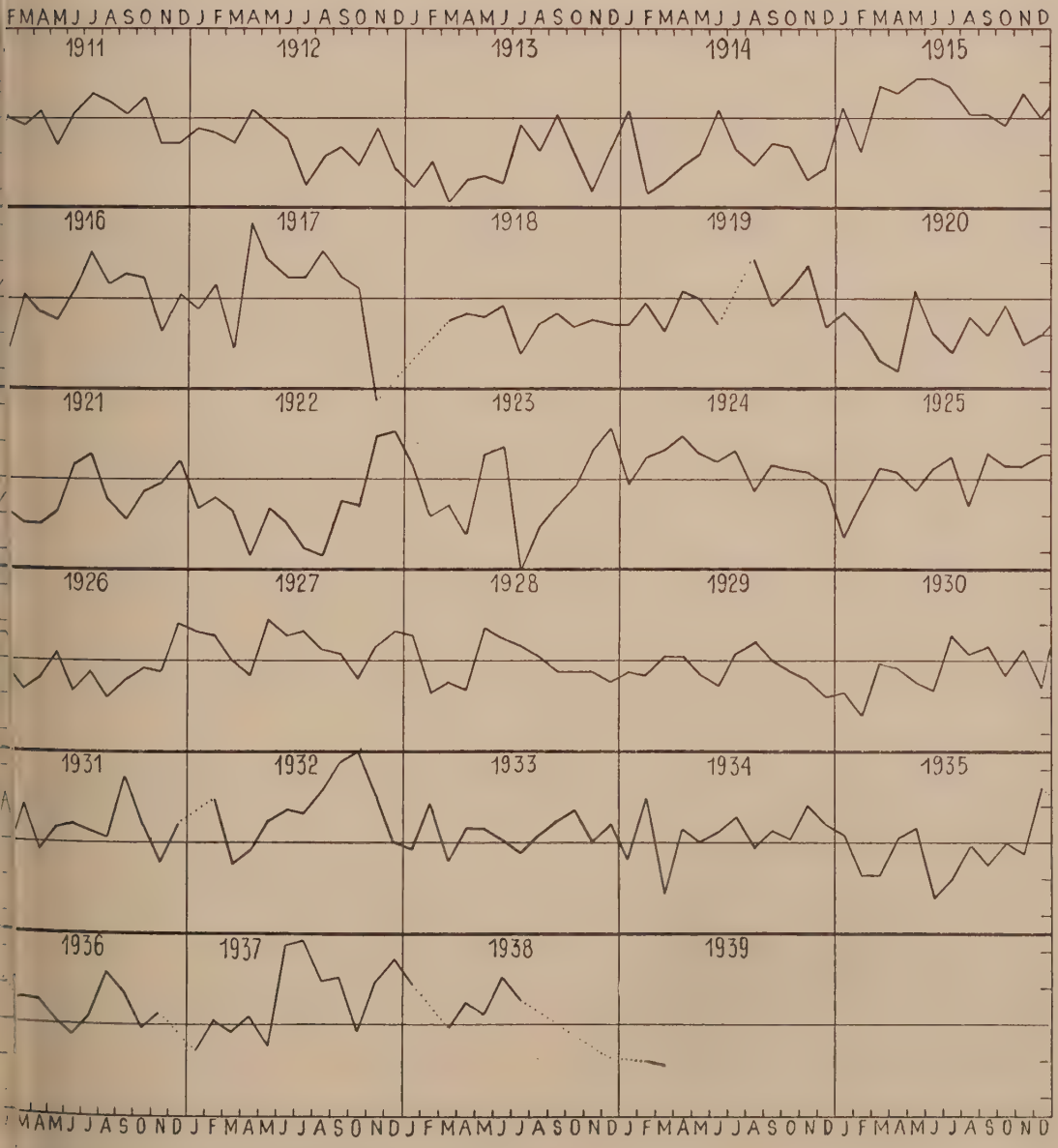


Fig. 3. Monthly anomalies of the surface temp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area E (see Fig. 1) during the years 1876—1939.

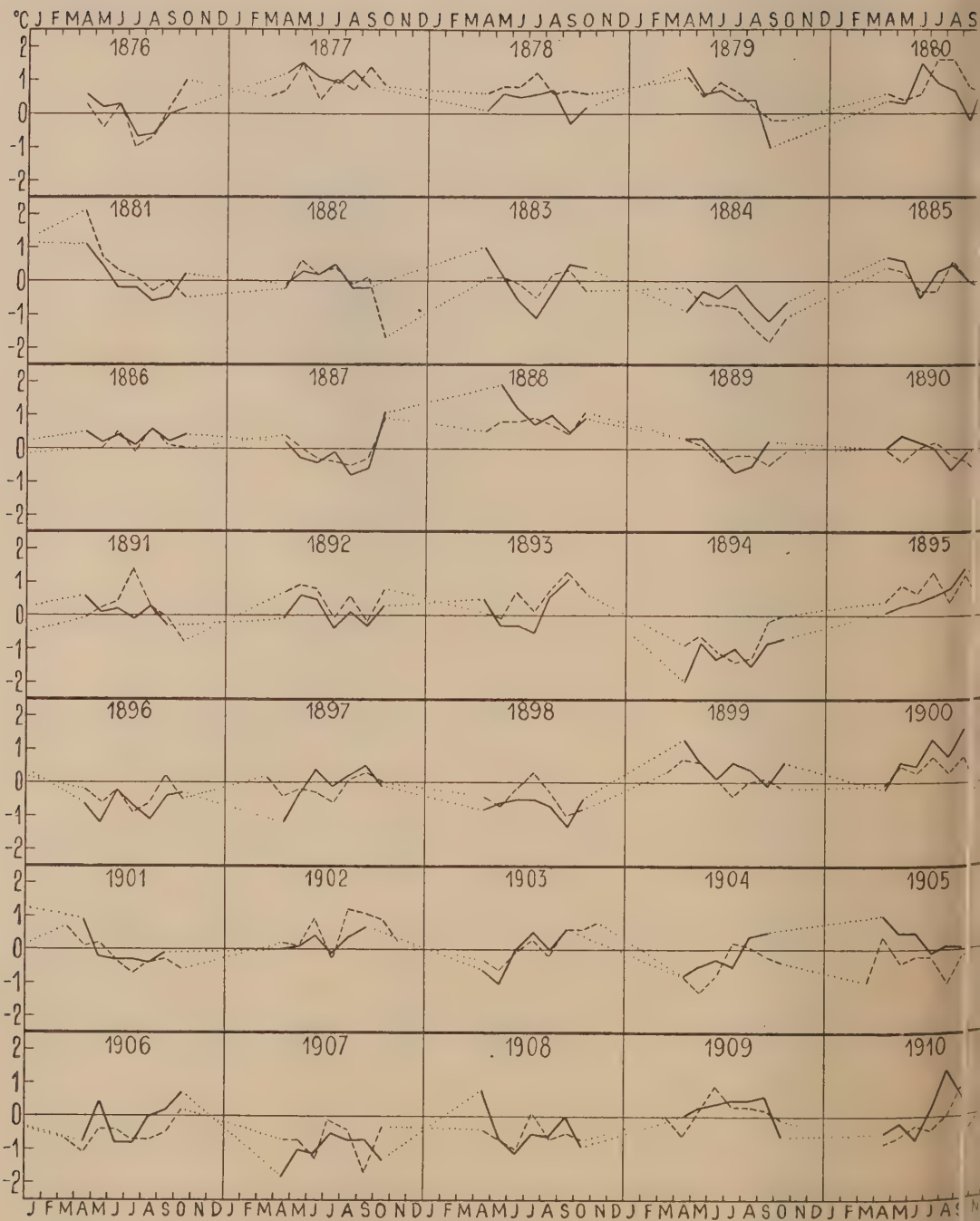
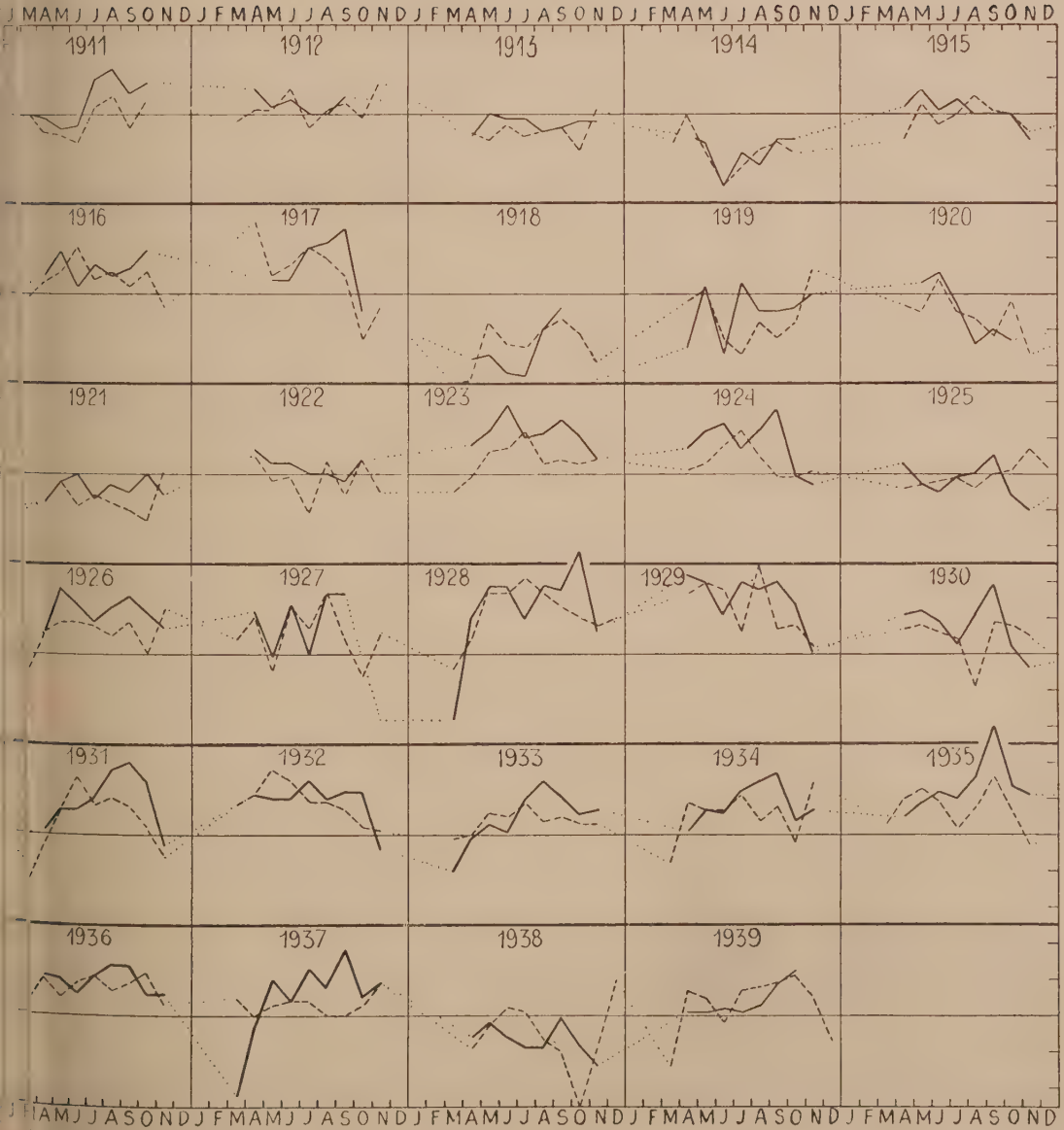


Fig. 4. Monthly anomalies of the surface temperature in the areas A and B (see g.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during the years 1876—1939. Solid lines: area A; dashed lines: area B.

Table 1. Monthly Anomalies (Δ °C) and Numbers (n) of Observations of the Su Temperature in the Area C (see Fig. 1) during the Years 1886—1939.

	March		April		May		June		July		August		September		October		November	D
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1886	—	—	—1·2	1	—	—	0·0	9	—0·8	2	—0·2	10	—	—	—	—	—	—
1887	—	—	0·5	1	—	—	—	—	—0·8	8	—0·8	12	—	—	—	—	—	—
1888	—	—	—	—	—	—	0·5	1	0·1	4	—	—	0·7	4	—	—	—	—
1889	—	—	—	—	—	—	—	—	—0·1	10	0·6	10	—	—	—	—	—	—
1890	—	—	0·4	4	—	—	1·0	1	—	—	—0·6	5	—	—	—	—	—	—
1891	—	—	—	—	0·5	4	0·9	10	—	—	—	—	—	—	—	—	—	—
1892	—	—	0·8	1	—	—	—	—	—	—	1·5	3	—	—	1·2	1	—	—
1893	—	—	—	—	—	—	—	—	—	—	1·2	2	1·7	3	—	—	—	—
1894	0·4	7	—	—	1·4	6	1·0	4	0·1	1	—0·8	8	0·4	9	—	—	—	—
1895	—	—	1·2	4	0·2	10	1·7	5	—	—	—0·9	15	—	—	—	—	—	—
1896	—	—	—	—	—0·4	1	0·2	12	—0·6	1	—	—	—	—	—	—	—	—
1897	—	—	—	—	—	—	0·7	1	0·7	1	0·0	4	—0·3	1	—	—	—	—
1898	—	—	—	—	0·2	7	—	—	—	—	0·0	9	—0·9	9	—	—	—	—
1899	—0·2	2	—	—	0·0	6	0·1	6	—0·4	3	—0·1	17	1·0	5	0·0	5	—	—
1900	—	—	—	—	—	—	1·0	2	0·9	10	0·5	15	0·3	23	—0·4	11	0·0	1
1901	—	—	—	—	—0·1	10	—	—	—1·0	9	0·3	10	0·3	11	—0·8	4	—	—
1902	—	—	—0·5	3	—	—	0·3	1	—	—	1·1	7	0·9	21	—	—	—	—
1903	—	—	0·3	3	—	—	—0·1	20	0·6	10	0·7	17	—0·8	4	—	—	—	—
1904	—	—	—0·7	3	—	—	0·0	5	—	—	1·6	12	0·6	9	—	—	—	—
1905	—	—	—0·4	2	—0·7	5	—1·1	11	—1·5	7	0·6	21	—0·3	15	—	—	—	—
1906	0·5	6	—2·2	2	—	—	—1·1	3	—0·2	11	—0·4	17	—0·5	25	0·4	10	—	—
1907	—	—	—0·2	6	—	—	—0·2	12	0·1	8	—0·3	7	—1·3	41	—0·1	3	—	—
1908	—	—	0·0	16	—0·8	3	—1·0	21	0·8	7	—0·3	28	—0·7	25	0·7	13	—	—
1909	—	—	—0·2	8	0·3	9	0·5	12	0·6	18	0·3	15	0·5	31	0·5	7	—	—
1910	—	—	—0·7	7	—0·7	1	—0·7	16	—0·4	5	0·3	22	—0·9	24	—0·3	21	—	—
1911	—	—	—0·3	9	—0·8	9	—1·9	6	0·1	7	0·4	8	—0·7	11	0·1	18	—	—
1912	—	—	1·5	7	—0·5	11	0·9	17	0·6	9	1·3	24	0·3	43	0·9	16	—	—
1913	—0·6	12	—0·1	16	—1·0	8	—0·6	16	0·1	32	—0·6	23	—0·3	81	0·5	20	—	—
1914	0·0	7	—0·8	10	—0·5	32	—1·6	22	—1·5	22	—0·9	24	—0·9	34	—0·7	30	0·0	2
1915	0.7	1	—0·2	6	—0·4	2	0·2	26	1·5	22	2·2	1	0·1	43	0·6	20	—	—
1916	0·2	14	—	—	—0·1	16	—1·0	7	—	—	—0·2	6	0·3	40	—0·5	17	1·0	3
1917	—	—	—0·4	1	0·4	28	0·9	7	1·8	25	1·3	24	—0·5	44	—0·7	37	—0·1	2
1918	—1·7	7	—0·7	5	0·1	4	—0·2	25	—1·1	55	—0·7	28	—1·2	76	—1·3	28	—	—
1919	—	—	—0·3	14	0·6	6	0·1	38	0·0	18	—0·8	14	—0·8	32	—0·6	26	0·4	3
1920	—1·2	1	—0·4	6	—0·2	12	0·3	17	—0·1	11	—0·8	44	—1·3	43	0·0	26	0·3	3
1921	—	—	—1·5	16	—0·4	4	—	—	—0·3	21	0·3	10	—2·0	43	—1·6	17	—	—
1922	—	—	—0·8	25	—1·4	2	—	—	—0·5	14	—0·5	28	—1·4	75	—0·6	13	1·2	3
1923	—	—	—1.0	3	0·0	1	0·8	12	—0·1	13	0·2	34	—0·3	23	0·6	17	0·4	2
1924	—	—	—0·1	10	—0·4	3	0·7	18	0·6	16	0·2	57	0·0	25	0·5	18	—0.2	3
1925	—	—	—0·5	15	—	—	—0·8	40	—0·3	36	—0·2	48	—0·3	15	—0·3	10	1·1	1
1926	—	—	0·4	3	0·4	24	0·2	10	0·8	30	0·6	65	0·4	26	0·2	24	1·1	2
1927	—	—	0·3	5	—	—	0·7	12	0·8	7	1·5	3	0·2	10	1·4	7	—	—
1928	—	—	—0·2	7	1·8	13	2·3	12	1·5	14	1·7	36	0·7	17	1·0	23	2·4	4
1929	—	—	0·7	10	0·9	8	1·3	19	1·6	12	2·3	81	0·7	20	0·6	20	—	—
1930	—	—	0·4	20	1·4	19	0·7	40	1·0	4	0·1	31	1·3	23	0·8	9	1·0	5
1931	1·0	9	0·6	4	1·0	2	0·9	23	0·0	19	1·5	41	1·2	17	0·6	8	—	—
1932	1·4	4	0·3	15	—0·2	10	2·1	35	0·6	47	1·6	28	0·1	58	0·7	28	1·3	6
1933	1·4	5	1·0	22	1·0	13	0·9	29	0·8	19	1·1	37	0·3	42	0·8	24	—	—
1934	0·8	9	0·6	17	—0·4	11	0·3	31	1·6	23	0·1	33	1·3	36	0·6	19	1·2	6
1935	0·9	3	0·1	21	1·5	9	0·5	14	0·2	28	1·2	44	2·0	13	1·2	6	0·9	2
1936	1.6	2	1·3	20	0·6	24	0·6	17	1·9	17	1·7	31	0·6	47	2·1	22	2·0	1
1937	0·9	4	0·0	23	0·0	18	0·0	18	1·0	32	0·5	37	0·0	25	0·5	25	1·0	2
1938	—	—	—0·4	37	0·0	21	1·3	15	0·2	24	—0·2	30	—1·1	61	—0·1	4	—	—
1939	1.5	1	0·7	15	0·4	12	0·1	18	1·2	13	2·0	50	1·7	49	1·3	7	1·2	2

Tables 2a & 2b. Monthly Anomalies (Δ °C) and Numbers (n) of Observations at the Standard [illegible] during the Years 1876–1895. (1876–1957 on pp. 20 & 21).

Area D	January		February		March		April		May		June		July		August		September		October		November		December	
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1876	—	—	—	—	—0·2	5	—0·1	20	0·2	27	—0·1	62	—1·2	10	—1·2	12	0·4	60	—0·1	10	—	—	—	—
1877	—	—	—	—	0·3	19	0·1	48	1·1	41	—0·3	26	—0·2	49	0·4	25	1·3	42	0·7	27	—	—	—	—
1878	—	—	—	—	—	—	0·5	64	—0·2	66	0·4	50	1·1	24	0·3	37	0·2	55	0·5	29	—	—	—	—
1879	—	—	—	—	—	—	0·6	67	0·6	46	0·9	52	0·6	43	0·8	47	0·9	29	0·1	5	—	—	—	—
1880	—	—	—	—	—	—	0·4	60	0·4	56	0·1	58	2·2	43	1·0	50	0·3	22	1·1	16	—	—	—	—
1881	—	—	—	—	—	—	2·0	36	0·6	71	—0·1	51	0·2	28	—0·5	59	0·1	60	0·4	17	—	—	—	—
1882	—	—	—	—	—	—	0·4	62	0·1	41	0·1	53	0·5	25	—0·4	64	—0·6	35	—0·4	21	—	—	—	—
1883	—	—	—	—	—	—	0·2	34	—0·3	48	—0·3	55	0·4	9	0·0	50	—0·2	51	—0·5	17	—1·3	6	—	—
1884	—0·6	4	—	—	—	—	—0·3	32	—0·7	38	—1·3	64	—1·3	30	—1·7	66	—2·0	30	—1·8	30	0·2	1	—	—
1885	—0.6	6	—	—	—	—	—0·5	37	—0·6	56	—0·6	33	—1·2	29	—0·1	14	—0·4	49	—0·6	27	0·2	5	—0·9	1
1886	—	—	—	—	—	—	—0·8	48	0·2	30	—0·2	56	0·1	42	0·7	12	—0·2	72	0·1	40	—	—	0·4	2
1887	—	—	—	—	—	—	0·2	32	0·5	38	0·0	65	0·0	19	—0·3	53	0·5	29	1·2	36	—	—	2·0	4
1888	—	—	—	—	—	—	0·3	13	0·6	56	0·9	82	1·2	42	1·1	49	0·6	16	2·0	25	1·5	4	—	—
1889	—	—	—	—	—	—	1·0	13	0·4	20	0·3	69	—0·5	21	—0·1	43	0·4	33	0·6	8	—	—	—	—
1890	—	—	—	—	—	—	—0·3	27	0·3	40	0·7	50	—0·4	33	—0·6	74	—0·8	26	—0·1	15	—	—	0·2	2
1891	—	—	—	—	—	—	0·2	25	0·4	42	0·8	55	0·6	10	0·3	68	0·4	36	—0·7	14	—0·4	1	—	—
1892	—	—	—	—	—	—	0·6	33	0·7	33	1·3	49	0·8	20	1·4	32	—0·2	54	0·7	43	0·6	19	0·2	4
1893	2·4	1	—	—	—	—	0·7	56	0·8	34	1·4	53	1·1	54	1·4	50	1·8	81	0·7	8	1·5	3	0·3	3
1894	—	—	—	—	—0·5	12	0·0	46	0·8	48	—0·1	61	—0·4	42	—0·7	26	0·3	44	0·8	51	0·7	6	—	—
1895	0·2	1	—	—	0·6	1	1·2	33	0·9	35	0·7	79	0·7	29	0·2	51	0·7	65	0·2	22	0·2	4	0·9	1

Area E.

1876	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0·0	1	—	—	—	—	—	—
1877	—	—	—	—	—	—	—	—	—	—	—0·3	7	0·1	4	0·5	2	—0·4	5	—	—	—	—	—	—
1878	—	—	—	—	—	—	—	—	—	—	0·9	5	0·8	8	—	—	—	—	0·7	7	—	—	—	—
1879	—	—	—	—	—	—	—	—	—	—	0·2	6	—	—	—	—	0·0	9	—	—	—	—	—	—
1880	—	—	—	—	—	—	—0·2	14	—	—	0·7	5	1·2	17	1·1	15	0·5	9	1·4	14	0·7	1	—	—
1881	—	—	—	—	—	—	—	—	—0·1	17	—0·3	8	—1·0	32	—0·6	13	0·0	5	—	—	—	—	—	—
1882	—	—	—	—	—	—	—1·5	16	0·2	6	—1·2	13	—1·0	13	—0·7	28	—0·2	11	0·0	5	—1·0	5	0·0	5
1883	—	—	—	—	0·8	9	—0·6	13	—0·1	19	—0·7	8	0·6	20	0·3	24	0·8	11	—0·2	11	—2·1	10	—0·4	22
1884	—2·6	8	—0·8	11	—1·1	15	—1·1	18	—0·8	18	—0·7	30	—1·4	32	—1·5	44	—1·2	36	—1·2	45	—1·0	45	—1·3	22
1885	—0·9	56	—1·2	23	—0·7	26	—0·4	27	—1·5	20	—1·5	27	—0·1	44	0·2	49	—0·3	45	0·7	45	1·2	36	0·2	20
1886	—	—	1·4	8	0·2	13	1·2	24	0·5	39	1·4	28	1·2	43	0·1	41	0·2	48	0·0	63	0·3	45	1·1	47
1887	—0·6	32	0·5	26	1·5	23	1·9	14	1·7	20	1·2	23	0·3	40	0·8	49	0·8	51	1·7	51	0·9	44	1·9	55
1888	1·6	18	2·6	26	2·3	14	1·6	28	2·5	25	1·9	36	0·9	28	1·3	27	0·9	19	2·3	22	0·2	28	0·4	24
1889	1·9	17	1·4	28	1·9	16	1·0	8	0·8	12	—0·3	12	1·0	28	0·5	26	1·5	26	0·3	11	—	—	—	—
1890	—0·1	25	1·0	9	—0·1	12	—0·4	6	—1·5	7	0·2	11	0·9	2	1·4	14	0·3	24	1·1	30	—0·6	23	—0·2	33
1891	1·1	11	0·6	12	0·9	11	1·4	24	1·0	19	0·6	18	0·6	38	1·4	45	0·0	46	—0·8	49	0·0	44	0·7	21
1892	—	—	0·5	26	0·5	17	1·0	19	0·5	22	0·0	47	0·7	46	0·6	56	0·8	50	1·4	82	1·1	56	1·6	85
1893	1·3	37	1·2	6	0·9	22	1·4	24	0·5	18	0·5	31	0·6	58	0·5	47	1·2	58	0·6	71	1·8	44	0·8	66
1894	1·1	43	0·2	22	0·1	20	—0·5	28	0·8	34	—0·3	30	—0·9	31	—0·8	38	—0·1	55	0·1	39	—0·8	47	—0·1	49
1895	0·4	42	0·6	28	0·2	21	0·0	31	—0·2	27	0·2	29	0·5	27	—0·1	68	—0·3	67	—0·4	61	0·1	80	—0·1	69

Table 2. Monthly Anomalies (Δ °C) and Numbers (n) of Observations of the Surface Temperature in the Area D (see Fig. 1) during the Years 1896—1939.

	January		February		March		April		May		June		July		August		September		October		November		December	
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1896	0·4	1	—	—	—	—	0·8	37	0·2	26	0·2	78	−0·6	34	0·5	36	0·7	34	−0·2	25	0·5	7	−0·5	1
1897	1·7	1	—	—	0·2	12	0·2	22	−0·2	53	0·0	26	−0·1	83	−0·4	43	−0·2	46	−0·2	24	0·9	4	1·8	5
1898	—	—	—	—	—	—	0·2	59	−0·4	13	0·7	78	0·6	23	−0·1	78	−0·5	70	−0·2	49	−1·1	6	0·5	1
1899	—	—	—	—	0·1	7	−0·1	55	0·6	52	0·0	40	−0·4	69	0·3	49	0·3	43	−0·2	45	−0·9	8	0·6	7
1900	—	—	—	—	0·8	4	−0·3	24	0·4	47	0·3	91	0·7	23	0·0	94	0·1	33	−0·2	26	−0·5	29	0·0	13
1901	−0·8	1	—	—	0·2	12	0·0	66	0·2	63	−0·2	83	1·3	29	−0·6	82	−0·6	45	−0·9	44	0·6	10	−0·5	1
1902	—	—	—	—	—	—	0·1	56	0·5	42	0·8	81	0·9	33	1·3	66	1·6	39	0·6	26	0·2	18	−0·4	5
1903	0·9	1	0·6	1	—	—	−0·1	49	−0·6	37	−0·1	74	−0·1	63	0·4	52	0·0	89	0·6	23	0·0	25	−1·1	27
1904	0·2	6	−2·4	1	—	—	−0·6	66	−0·7	34	−0·6	71	0·3	34	−0·1	40	−0·7	75	−1·4	23	−0·6	19	−1·0	8
1905	−0·3	4	−0·4	1	—	—	−0·8	18	−0·9	35	−0·4	57	−0·6	27	−0·5	48	−1·0	32	−0·1	11	0·3	4	−1·5	1
1906	—	—	—	—	0·0	13	−1·3	34	−0·6	84	−0·7	41	−0·6	82	−0·7	37	−1·1	44	−0·8	34	0·3	4	1·8	1
1907	0·4	2	—	—	—	—	−1·1	66	−0·8	31	−0·8	58	−0·7	51	−1·1	42	−0·6	40	−0·2	50	−2·1	1	—	—
1908	−0·6	1	—	—	—	—	−0·3	44	−0·9	51	−1·2	54	−0·3	72	−1·0	52	−0·9	41	0·1	51	−0·1	5	—	—
1909	—	—	—	—	−0·4	17	−0·4	50	−0·2	28	0·4	42	0·0	58	−0·2	42	−0·1	31	−0·1	56	1·6	1	1·3	1
1910	—	—	—	—	—	—	−0·4	71	−0·7	87	0·1	47	−0·7	63	0·2	49	−0·4	43	−0·5	66	0·0	22	0·4	1
1911	1·1	2	—	—	0·2	10	−0·7	55	−0·7	60	−0·5	25	−0·4	92	0·6	75	0·1	33	0·5	36	−0·6	5	—	—
1912	—	—	0·9	1	−0·1	12	0·0	72	−0·3	49	0·5	33	−0·1	112	0·7	60	0·3	72	−0·9	55	0·1	32	—	—
1913	−0·5	1	—	—	−0·8	2	−0·8	163	−1·0	121	−1·0	69	−0·5	42	−0·8	90	−1·4	47	−0·5	72	−0·3	43	—	—
1914	—	—	—	—	−0·5	21	−0·9	104	−1·1	48	−1·4	55	−1·6	76	−1·5	79	−1·0	51	−0·9	57	−0·6	4	−0·5	2
1915	—	—	0·7	1	0·0	7	−0·6	133	−0·3	52	0·1	71	1·3	78	1·3	54	0·8	85	0·7	45	0·3	33	0·4	1
1916	0·6	2	—	—	−0·4	8	−0·2	196	0·1	59	−0·8	31	0·0	29	−0·5	77	0·7	59	0·5	43	0·0	14	—	—
1917	0·1	2	—	—	−1·8	2	0·9	31	0·5	56	0·4	87	1·4	47	1·4	23	1·1	43	−1·4	17	0·1	6	1·5	1
1918	—	—	—	—	0·0	16	0·9	28	0·3	55	−0·6	84	−1·3	44	−0·5	71	−1·4	80	−1·3	40	−0·6	27	—	—
1919	−0·2	2	1·1	1	—	—	0·0	19	0·5	50	−0·1	12	−0·5	20	−0·7	108	−0·6	22	−0·6	59	1·0	32	—	—
1920	—	—	—	—	−0·9	9	−0·5	15	−0·2	7	0·2	6	−0·5	131	−0·8	58	−1·3	51	0·0	20	−1·0	41	—	—
1921	0·4	1	—	—	—	—	−0·4	64	−0·6	19	−1·2	68	−1·0	38	−1·0	103	−1·1	51	−0·4	37	−0·9	45	—	—
1922	1·7	3	—	—	—	—	−0·2	80	−0·8	56	−1·2	81	−1·6	65	−0·4	17	−1·7	83	−0·7	29	−0·8	18	—	—
1923	—	—	—	—	−0·1	13	−0·4	95	0·1	26	−0·1	40	0·2	81	−0·2	40	−0·9	59	−0·3	57	0·4	17	−0·4	2
1924	2·4	3	—	—	—	—	0·0	30	0·2	64	0·7	36	1·2	91	0·7	39	−0·1	59	0·0	38	−0·2	41	−0·7	4
1925	1·9	4	−1·9	1	−2·1	1	−0·8	235	−0·5	84	−0·5	70	−0·8	104	−1·2	55	−1·3	59	−0·4	58	0·4	36	1·2	2
1926	2·4	3	1·1	1	−0·5	10	0·2	76	0·6	131	0·1	53	0·2	44	−0·6	72	−0·8	82	−0·8	55	0·0	79	0·5	14
1927	1·2	3	−0·3	2	−1·3	11	0·6	12	0·4	9	0·4	64	0·7	53	1·2	35	0·6	36	0·2	53	0·6	19	0·9	16
1928	0·8	4	−1·5	3	−0·2	33	0·1	60	1·2	62	1·9	51	1·5	34	1·0	65	0·2	64	1·1	63	0·3	40	0·5	8
1929	1·9	5	—	—	0·6	8	0·9	72	−0·3	25	0·3	33	0·8	50	1·1	64	0·2	55	0·1	55	−0·5	42	−1·0	10
1930	0·2	8	—	—	−0·5	1	0·3	105	0·5	51	0·0	54	−0·5	106	0·2	81	1·0	93	0·0	84	0·3	29	—	—
1931	2·0	8	−0·2	3	−0·6	29	−0·1	107	0·6	42	1·1	51	0·3	59	0·6	27	1·4	58	0·3	33	−1·1	14	1·6	4
1932	—	—	—	—	1·0	16	0·5	59	1·2	25	1·6	26	1·1	30	1·1	23	0·5	55	0·2	25	0·1	23	—	—
1933	0·7	5	—	—	0·7	25	0·7	53	1·2	31	0·6	20	0·7	31	0·1	20	0·0	31	0·4	38	0·3	41	1·3	3
1934	0·7	2	—	—	−0·4	12	0·1	65	−0·2	26	0·0	43	0·3	12	0·2	35	0·0	57	−0·1	27	0·6	27	0·8	2
1935	2·8	2	−0·4	1	0·2	15	0·5	29	0·8	24	0·5	20	−0·8	6	−0·2	18	0·7	13	−0·2	47	−1·2	11	−0·2	1
1936			0·6	1	0·9	16	−0·9	50	0·7	56	0·5	29	1·3	26	0·7	7	0·9	27	1·5	32	0·1	26		

	January		February		March		April		May		June		July		August		September		October		November		December	
	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
1896	0·6	61	0·8	43	0·5	47	0·8	23	0·5	22	−0·2	32	0·2	82	0·8	61	0·9	67	0·7	83	1·3	68	0·7	59
1897	1·1	63	1·0	35	−0·3	31	−0·1	24	−0·2	31	0·4	29	0·2	46	−0·2	55	−0·2	75	0·2	88	0·8	41	−0·3	72
1898	0·5	24	0·5	17	0·5	27	−0·1	33	0·6	39	0·9	51	1·8	77	1·2	108	1·2	116	−0·4	87	−0·5	49	−0·5	56
1899	−0·1	28	−0·4	17	0·5	33	0·4	25	1·2	33	0·3	34	0·1	75	0·9	74	0·5	60	0·9	80	0·5	105	1·3	69
1900	0·3	5	1·1	17	2·2	32	1·2	42	0·7	44	−0·2	40	−1·0	48	−1·2	83	−0·2	109	−0·2	101	−0·2	104	0·1	86
1901	0·0	52	0·6	38	0·3	54	0·1	48	−0·3	62	0·1	60	−0·7	64	−0·1	68	−0·4	98	−1·5	75	0·2	70	0·8	80
1902	0·6	73	1·5	27	1·1	26	0·6	55	1·8	44	0·8	64	1·4	56	1·6	54	1·3	84	0·2	72	−0·2	64	−0·7	75
1903	0·0	54	−0·1	56	−1·3	54	−0·5	26	−1·2	40	−0·6	66	−0·6	96	−0·8	85	−0·2	77	−0·4	106	−0·1	129	0·1	86
1904	−0·9	90	−1·0	64	−1·2	75	−1·0	34	−0·9	48	−1·4	58	−1·5	61	−1·0	88	−1·7	101	−1·7	143	−0·7	110	−0·6	86
1905	−0·8	70	−0·7	44	−1·1	38	−0·4	41	0·0	42	−1·5	56	−1·5	49	−1·0	89	−0·8	63	0·2	76	−0·3	46	−0·3	31
1906	−0·1	42	−0·4	30	−0·1	27	0·2	39	0·0	69	0·6	56	−0·1	52	−1·1	124	−1·0	105	−0·9	118	−0·5	80	0·0	45
1907	0·0	15	−0·6	40	0·0	30	0·2	38	−0·5	65	−0·7	55	0·2	99	−0·5	100	−0·1	83	−0·1	105	−0·5	57	−0·7	37
1908	−0·1	12	0·3	46	−0·4	36	−0·4	39	1·0	43	−1·0	51	−0·6	45	0·2	64	0·0	74	−0·5	66	0·1	68	−0·4	37
1909	−0·5	10	0·2	31	1·0	38	0·0	42	0·5	37	0·8	69	0·7	23	0·8	69	0·8	56	0·2	79	1·8	40	1·4	44
1910	0·9	9	0·6	20	−0·7	37	0·8	30	0·5	28	0·4	55	0·4	24	0·1	45	0·6	58	0·1	64	0·7	76	0·9	36
1911	0·6	30	0·0	36	−0·2	49	0·2	39	−0·7	49	0·2	41	0·7	36	0·5	92	0·1	84	0·6	84	−0·7	84	−0·7	30
1912	−0·3	20	−0·4	50	−0·7	33	0·2	28	−0·2	8	0·6	10	−1·8	31	−1·1	22	−0·8	58	−1·3	64	−0·3	63	−1·4	32
1913	−1·9	37	−1·2	42	−2·3	41	−1·7	45	−1·6	27	−1·8	30	0·2	39	−0·9	48	0·1	69	−1·0	94	−2·0	64	−0·8	31
1914	0·2	25	−2·1	33	−1·8	10	−1·3	29	−1·0	38	0·3	31	−0·9	63	−1·3	67	−0·7	70	−0·8	146	−1·7	47	−1·4	26
1915	0·3	35	−0·9	27	0·9	69	0·7	36	1·1	28	1·1	48	0·9	48	0·1	43	0·1	68	−0·2	66	0·7	51	0·0	34
1916	0·6	17	−1·4	28	0·1	40	−0·4	34	−0·6	39	0·2	91	1·3	44	0·4	139	0·7	80	0·6	95	−0·9	75	0·1	17
1917	−0·3	47	0·1	13	−1·4	5	2·1	15	1·1	30	0·6	47	0·6	44	1·3	18	0·6	8	0·3	12	−2·8	3	—	—
1918	—	—	—	—	−0·6	4	−0·4	11	−0·5	6	−0·2	10	−1·5	9	−0·7	7	−0·1	16	−0·8	26	−0·6	24	−0·7	17
1919	−0·7	64	−0·1	23	−0·9	47	0·2	37	0·0	23	0·7	23	—	—	1·1	27	−0·2	28	0·3	36	0·9	47	−0·8	26
1920	−0·4	37	−0·9	38	−1·7	24	−2·0	9	0·2	3	−1·0	11	−1·5	24	−0·5	31	−1·0	40	−0·2	40	−1·3	49	−1·0	40
1921	−0·4	9	−0·9	18	−1·2	21	−1·2	36	−0·9	21	0·4	24	0·7	26	−0·6	20	−1·1	38	−0·3	28	−0·1	53	0·5	22
1922	0·8	32	−0·5	18	−0·9	23	−2·1	8	−0·8	21	−1·2	16	−1·9	18	−2·1	24	−0·6	34	−0·7	32	1·2	26	1·3	11
1923	0·4	11	−1·0	20	−0·7	20	−1·5	17	0·7	20	0·9	19	2·5	33	−1·3	28	−0·7	39	−0·2	54	0·8	47	1·4	26
1924	−0·1	20	0·6	25	0·8	21	1·2	18	0·7	19	0·5	23	0·8	19	−0·3	18	0·4	61	0·3	45	0·2	45	−0·1	30
1925	−1·6	10	−0·6	28	0·3	26	0·2	31	−0·3	35	0·3	24	0·6	17	−0·7	35	0·7	38	0·4	63	0·4	39	0·7	20
1926	0·7	16	−0·3	22	−0·8	18	0·5	22	0·2	40	−0·8	14	−0·3	27	−1·0	34	−0·5	56	−0·2	47	−0·3	49	1·0	59
1927	0·8	20	0·7	19	0·0	18	−0·4	15	1·1	21	0·7	35	0·8	33	0·3	69	0·2	79	−0·5	56	0·4	68	0·8	31
1928	0·7	21	−0·9	24	−0·6	43	−0·8	30	0·9	23	0·6	37	0·4	49	0·1	65	−0·3	53	−0·3	60	−0·3	50	−0·6	33
1929	−0·3	42	−0·4	29	0·1	39	0·1	39	−0·4	20	−0·7	37	0·2	48	0·5	73	0·0	87	−0·3	110	−0·5	43	−1·0	66
1930	−0·9	40	−1·5	56	−0·1	35	−0·2	36	−0·6	49	−0·8	83	0·7	72	0·2	81	0·4	107	−0·4	108	0·3	67	−0·7	61
1931	1·3	26	−0·3	6	1·0	4	−0·2	21	0·4	34	0·5	42	0·3	35	0·1	37	1·8	58	0·5	37	−0·5	19	0·5	20
1932	—	—	1·2	10	−0·6	13	−0·2	7	0·6	14	0·9	26	0·8	29	1·4	25	2·2	39	2·5	29	1·3	30	0·0	10
1933	−0·2	22	1·1	7	−0·5	14	0·4	28	0·4	33	0·1	29	−0·3	17	0·2	19	0·6	40	0·9	40	0·0	33	0·5	16
1934	−0·4	8	1·2	14	−1·4	15	0·4	14	0·0	21	0·3	20	0·7	20	−0·1	27	0·3	37	0·1	31	1·0	22	0·5	10
1935	0·2	8	−0·9	8	−0·9	7	0·1	9	0·4	7	−1·5	9	−1·0	9	−0·1	19	−0·6	31	0·0	10	−0·3	12	1·5	9
1936	—	—	0·6	4	0·7	14	0·6	13	0·1	24	−0·3	6	0·2	44	1·4	15	0·9	16	−0·1	22	0·3	21	—	—
1937	−0·7	24	0·1	24	−0·2	19	0·2	11	−0·6	30	2·2	39	2·3	9	1·2	38	1·3	31	−0·2	31	1·2	35	1·8	23
1938	1·1	16	—	—	−0·1	6	0·6	8	0·3	26	1·3	30	0·7	15	—	—	—	—	—	—	—	—	0·9	20
1939	—	—	−1·0	16	−1·1	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4. Monthly Anomalies (Δ° C.) and Numbers (n) of Observations of the Surface Temperature in the Areas A, B, C, D and E (see Fig. 1) for the Period July 1945—December 1946.

Month	Area	A		B		C		D		E	
		Δ	n	Δ	n	Δ	n	Δ	n	Δ	n
July	1945	0·0	34	—0·5	59	0·8	24	0·1	18	—	—
August	,,	0·8	40	—1·3	35	0·9	37	—	—	—	—
September	,,	—0·6	72	0·1	21	0·1	11	0·0	5	—	—
October	,,	0·4	64	—0·5	44	0·1	21	—1·1	3	—	—
November	,,	—	—	1·3	1	1·7	1	1·1	12	—	—
December	,,	—	—	—0·5	1	0·6	1	—	—	—	—
January	1946	—	—	—	—	—	—	—	—	—	—
February	,,	—	—	—	—	—	—	—	—	—	—
March	,,	—	—	—	—	—	—	—	—	—	—
April	,,	0·2	7	0·7	59	0·2	33	0·6	43	—	—
May	,,	1·1	48	0·5	78	1·2	40	0·0	29	—	—
June	,,	0·7	38	0·4	40	2·0	41	0·7	11	—	—
July	,,	0·0	87	—0·7	86	—0·1	30	—0·2	14	—	—
August	,,	0·0	18	—0·5	30	0·1	13	—0·7	21	—1·4	8
September	,,	0·4	73	—0·6	120	—0·2	70	—1·0	36	—0·3	16
October	,,	1·4	15	0·4	43	1·1	46	0·8	18	1·2	17
November	,,	0·2	18	0·0	36	1·2	5	1·4	14	—1·2	15
December	,,	—	—	—0·4	6	1·1	3	2·5	4	0·9	25

THE FISH.

Lemon Sole.

Faroes.

During 1946 eight samples of lemon sole measurements and scales were obtained from Aberdeen trawlers fishing at Faroe. These, totalling 765 fish, exhibit the following size frequencies in 5-cm. groups.

	< 25	26—30	31—35	36—40	41—45	46—50
	20	168	314	212	48	3
%	2·6	22·0	41·0	27·7	6·3	0·4

Compared with similar figures for the previous year this shows a general reduction in the size of lemon soles now being caught at Faroe. Too much emphasis, however, should not be placed on this point since the 1946 samples include a number from north coast grounds between Myling Head and Fuglø which normally support a larger percenta of younger, and therefore smaller, fish than oth Faroese grounds. On the other hand, the avera size of 501 lemon soles from Fuglø grounds 1945 was 35·2 cm., whereas the average for 2 fish from approximately the same grounds in 19 is 34·1 cm.

The age composition of the 1946 samples is given in the table below.

Both sets of figures agree in confirming la year's results by emphasising the *predominance the 1937 and 1939 broods* and also to a less exte that of 1936. Towards the end of 1946 the *19 brood* began to appear in the catches in greate numbers with the result that from grounds lyin off the north coast of the islands it exceeds a others numerically and already gives promise o being above average strength.

Locality	Broods Year	1943 3+	1942 4+	1941 5+	1940 6+	1939 7+	1938 8+	1937 9+	1936 10+	1935 11+	1934 12+	1933 13+	1932 14+	1931 15+	1927 19+	Tota
Fuglø, Bordø Grounds	No.	1	2	40	11	57	20	43	29	14	13	3	2	2	1	238
	%	0·4	0·8	16·8	4·6	23·9	8·4	18·1	12·2	5·9	5·5	1·3	0·8	0·8	0·4	100
N.W. Myggenæs to N.E. Fuglø	No.	30	20	118	21	108	29	103	53	28	11	4	—	1	—	526
	%	5·7	3·8	22·4	4·0	20·5	5·5	19·6	10·1	5·3	2·1	0·8	—	0·2	—	100

Bennet B. Rae.

Larval Herring. Iceland 1946 (10 minutes' hauls).

	6451	6452	6453	6454	6455	6456	6457	6458	6460	6461	6462	6463	6464
	10/9	11/9	11/9	11/9	11/9	11/9	11/9	12/9	15/9	15/9	16/9	16/9	16/9
	23 25′	5 00′	7 40′	11 05′	13 55′	19 31′	22 17′	4 30′	15 00′	21 00′	0 20′	3 35′	7 35′
	64°25′5	64°47′	64°47′	65°11′	65°26′	66°00′	66°16′	65°42′	63°42′	63°11′	63°21′	63°31′	63°41′
	23°05′	24°13′	24°02′	24°20′	24°30′	24°07′	23°38′	24°49′	22°17′	21°16′	21°04′	20°52′	20°40′
	111	111	90	78	60	46	43	65	140	300	130	89	56
.1)	300	200	250	200	150	100	100	200	300	300	300	200	150
	150	150	150	150	100	75	75	100	200	200	200	100	100
	50	50	50	50	50	25	25	50	100	100	100	50	50
n.													
	—	—	—	—	—	—	1	—	—	—	—	—	—
	—	—	—	—	—	—	1	1	—	—	—	—	—
	—	—	—	6	—	—	1	—	—	—	—	—	—
	—	1	—	15	2	2	9	5	—	—	—	—	—
	—	3	—	60	13	5	33	22	—	—	—	—	—
	—	2	—	45	23	8	63	32	1	—	—	1	—
	—	4	—	22	38	2	39	46	—	—	1	2	—
	—	7	—	22	39	2	26	40	1	—	—	1	1
	2	10	—	17	34	3	22	22	—	—	—	2	—
	2	18	—	8	33	—	19	27	—	—	1	4	—
	—	6	1	4	20	—	11	23	—	—	1	2	—
	1	9	—	2	14	1	8	18	—	—	4	—	—
	2	9	—	1	6	1	7	5	—	—	1	1	—
	2	8	—	1	—	—	3	1	—	—	—	1	—
	3	9	—	—	2	—	3	3	1	—	—	2	—
	2	10	—	—	—	—	1	2	—	—	1	—	1
	1	4	—	—	—	—	1	—	—	—	1	—	—
	2	9	1	—	—	—	—	1	1	—	—	—	—
	3	9	—	—	—	—	—	2	—	—	—	—	—
	1	4	—	—	—	—	2	—	—	—	—	—	—
	5	2	—	—	—	—	—	—	—	—	1	—	—
	5	4	—	—	—	—	—	—	—	—	—	—	—
	5	1	—	—	—	—	—	—	—	—	—	—	—
	4	—	—	—	—	—	—	—	—	—	—	—	—
	—	3	—	—	—	—	—	—	—	—	—	—	—
	1	—	—	—	—	—	—	—	—	—	—	—	—
	2	2	—	—	—	—	—	—	—	—	—	—	—
	1	1	—	—	—	—	—	—	—	—	—	—	—
	—	1	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	1	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	1	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—
	44	138	2	203	224	24	1498[3])	1221[4])	4	0	11	16	2
d	44	138	2	203	224	24	250	250	4	0	11	16	2
.2)	28·55	23·78	24·00	15·93	18·38	16·29	17·09	17·96	21·25	—	22·50	19·81	21·50

uls with 2-m. stramin net; net towed about 3×10 minutes at a depth corresponding to the lengths of wire out.
by + 0·5.
easured.
easured.

Iceland.

Herring. Larval stages. September 1946.
● larvae present. *Total catch* per ½ hour hauls and *average size* in mm. of larvae indicated.
× larvae not present.

Occurrence of Larval Stages. Autumn 1946.

During the "Dana" cruise to Iceland in September 1946, a survey of the pelagic stages of herring larvae off the west- and south-west coasts was carried out. Unfortunately investigations could not be carried out along the north and the south-east coasts owing to lack of time etc.; consequently information from these parts of the Icelandic area is lacking. The material was collected with the 2-m. stramin net by 30-minute oblique hauls. The richest hauls were obtained off north-west Iceland, where the maximum catch per haul was about 1,500 specimens; the average size here being about 16 to 18 mm. The prevailing currents in the area ha obviously carried the larvae from the spawnin places at the mouth of Faxa Bay to more northerl localities, and probably also to the north coast from which area no observations are available, a already stated. The average size of larvae wa greatest at the southern stations, where spawnin commences earlier than further north. This year class seems to be above the average for the pre war years for which observations are available (cf Rapp. et Proc. Verb., Vol. XCIX, 1936, VI an Ann. Biol. I, 1943, p. 86). Details are given in th accompanying table and on the above map.

Tåning.

Plateau Continental Atlantique.

INTRODUCTION.

L'activité reste toujours réduite dans le secteur Plateau Continental Atlantique et, seules, sont venues aux Annales Biologiques, quelques constations de l'Eire et de la France.

Elles résument, sous forme de tableaux, les observations biométriques faites sur les lieux de pêche ou au débarquement sur les espèces comestibles suivantes:

Merlu	(*Merlucius merluccius* Linné)
Plie	(*Pleuronectes platessa* Linné)
Cardine	(*Lepidorhombus megastoma* Donovan)
Hareng	(*Clupea harengus* Linné)
Sardine	(*Sardinia pilchardus* Walbaum)
Anchois	(*Engraulis encrasicholus* Cuvier)
Argentine	(*Argentina sphyraena* Linné)
Maquereau	(*Scomber scombrus* Linné)
Grondin gris	(*Trigla gurnardus* Linné)

J. le Gall.

THE FISH.

Merlu.

Mensurations.

Les mensurations effectuées en 1946 par les laboratoires de Concarneau et de La Rochelle portent sur plus de 10,500 individus. Toutes furent effectuées à terre sauf celles du mois de Février (Petite et Grande Sole) qui le furent en grande partie à la mer. Ces dernières peuvent par suite être considérées comme assez représentatives de l'état du stock pour ce mois et ce secteur. Elles montrent qu'entre 47 et 72 cm. toutes les classes étaient également bien représentées.

Au cours du premier trimestre plusieurs classes apparaissent nettement autour de 17, 27 et 37—39 cm. Une autre classe est également bien indiquée entre 53 et 55 cm. en Janvier—Février puis entre 55 et 57 cm. en Mars. En Avril—Mai les jeunes de 17 cm. se retrouvent autour de 20 cm.

Au delà de 60 cm. les diverses classes paraissent avoir des valeurs numériques très voisines et les sommets qui les représentent sur le graphique sont vraisemblablement compliqués par le fait que les différences de taille entre ♂ et ♀ s'amplifient à partir de 60 cm. (cf. Hickling: Rapp. Atlant. 1930, Rapp. et Proc.-Verb. Vol. No. 77, p. 57).

En Septembre les mensurations ne sont pas assez nombreuses et la courbe de population ne montre aucun sommet bien net si ce n'est à 37, 49 et 60 cm.

Tableau 1.
Mensurations Effectuées en 1946.

Mois	I Janvier	II Février	III Mars	IV Mars	V Mars	VI Avril	VII Mai	VIII Septembre
Origine.	N. du Golfe	Pte et Gde Sole	N. du Golfe	Pte et Gde Sole	N. du Golfe	N. du Golfe	N. du Golfe	Melville-Jones Bk.
Observateur.	Letacon-noux	Letacon-noux	Forest	Forest	Dizerbo	Dizerbo	Dizerbo	Letacon-noux
Nbre d'individus	878	2,167	2,017	1,290	659	1,538	1,474	548
Tailles de 5 en 5 cm.	Fréquence des tailles pour mille individus.							
10—14	—	—	—	—	77·0	3·0	—	—
15—19	—	—	—	—	702·5	402·0	332·5	—
20—24	—	—	27·3	—	199·5	552·0	653·0	1·8
25—29	5·5	—	102·6	4·7	21·0	40·0	13·0	1·8
30—34	36·3	4·1	24·9	38·0	—	3·0	1·5	36·6
35—39	111·6	32·6	81·7	130·1	—	—	—	78·4
40—44	121·8	59·9	50·5	205·4	—	—	—	60·4
45—49	112·7	122·6	10·9	138·6	—	—	—	107·7
50—54	288·1	167·4	46·5	80·0	—	—	—	149·6
55—59	239·1	129·2	155·5	62·0	—	—	—	176·9
60—64	70·4	122·4	104·8	84·5	—	—	—	162·4
65—69	11·2	133·8	117·8	88·8	—	—	—	69·4
70—74	—	102·5	99·6	69·7	—	—	—	32·9
75—79	1·1	55·8	78·2	30·9	—	—	—	34·7
80—84	1·1	30·8	48·6	27·0	—	—	—	29·3
85—89	1·1	21·6	34·3	22·5	—	—	—	21·8
90—94	—	8·6	11·8	13·9	—	—	—	18·1
95—99	—	6·3	4·9	3·1	—	—	—	11·0
100—104	—	1·2	0·1	—	—	—	—	5·4
105—109	—	0·8	—	0·8	—	—	—	—
110—114	—	0·4	—	—	—	—	—	1·8
	1000·0	1000·0	1000·0	1000·0	1000·0	1000·0	1000·0	1000·0
				Taille moyenne:	17·8	20·0	20·4 cm.	

Corrélation Taille/Poids.

'étude du rapport entre la taille et le poids du
u repose sur l'examen de 845 individus vidés.
:hiffres obtenus à Concarneau et La Rochelle
)ncordent pas exactement, ceux de La Rochelle
, pour les merlus entre 30 et 50 cm., plus
de 10 à 20 g. en moyenne. Cette différence
ient des méthodes de pesée utilisées: une pesée
individu à La Rochelle, une pesée pour plu-
s individus de même taille à Concarneau.

La variation du poids par rapport à la taille peut être représentée par les formules suivantes (Forest):

Merlus de moins de 32 cm.: $P = 0{\cdot}0037\ X^{3{\cdot}14}$.
Merlus de plus de 32 cm.: $P = 0{\cdot}005\ X^{3{\cdot}02}$.
P étant le poids et X la taille.

Le poids du merlu est donc, les jeunes individus étant mis à part, sensiblement proportionnel à la puissance cubique de la taille.

R. Letaconnoux.

Tableau 2. Relation Taille/Poids. (Merlu vidé.)

Concarneau.		La Rochelle.			
N.	Poids moyen	Poids moyen	Limites de la variation	Etendue	N.
19	71	—	—	—	—
37	83	70	—	—	1
33	93	—	—	—	—
41	105	—	—	—	—
39	118	—	—	—	—
39	135	—	—	—	—
46	146	167	160— 175	15	2
35	162	172	170— 175	5	2
27	178	200	185— 215	30	4
24	197	216	200— 230	30	10
17	214	230	200— 260	60	21
8	235	249	215— 280	65	30
18	256	265	215— 310	95	32
9	282	287	260— 335	75	30
5	300	307	270— 345	75	22
4	315	336	285— 390	105	19
3	337	376	350— 390	40	8
3	373	378	330— 415	85	8
3	417	433	375— 510	135	8
—	—	454	425— 495	70	4
—	—	511	495— 530	35	4
5	520	538	500— 560	60	3
2	550	570	510— 615	105	7
1	530	602	570— 640	70	5
8	620	614	580— 640	60	6
6	655	620	600— 660	60	4
5	670	701	640— 740	100	6
10	727	761	710— 815	105	3
7	735	787	775— 800	25	2
6	780	806	700— 925	225	11
1	820	871	810— 960	150	8
3	915	896	830—1,000	170	5
6	925	926	900—1,025	125	5
2	980	926	845—1,000	155	4
4	1,065	1,007	890—1,125	235	7
1	1,000	1,135	1,060—1,165	105	7
2	1,035	1,220	—	—	1
6	1,185	—	—	—	—
4	1,210	—	—	—	—
2	1,300	1,530	—	—	1
5	1,335	1,400	—	—	1

Concarneau.			La Rochelle.			
cm.	N.	Poids moyen	Poids moyen	Limites de la variation	Etendue	N.
64	—	—	1,600	1,400—1,800	400	2
65	1	1,410	1,550	1,500—1,600	100	4
66	1	1,570	1,953	1,820—2,020	200	3
67	1	1,470	1,733	1,600—2,000	400	3
68	—	—	1,832	1,600—2,200	600	5
69	—	—	1,700	1,400—2,170	770	6
70	—	—	1,940	1,800—2,000	200	5
71	—	—	2,220	2,100—2,380	280	4
72	—	—	2,289	1,900—2,510	610	7
73	1	2,060	2,267	2,110—2,560	450	4
74	—	—	2,363	2,000—2,560	560	6
75	1	2,300	2,536	2,100—2,860	760	14
76	1	2,560	2,511	2,300—2,800	500	9
77	—	—	2,707	2,500—3,065	565	8
78	2	2,460	2,771	2,500—3,115	615	4
79	—	—	2,875	2,500—3,100	600	7
80	—	—	2,683	2,600—2,835	235	4
81	—	—	2,885	2,400—3,000	600	7
82	—	—	3,200	—	—	1
83	—	—	3,040	2,700—3,300	600	9
84	1	3,850	3,400	—	—	1
85	—	—	3,400	—	—	1
86	—	—	3,942	3,925—3,960	35	2
87	—	—	3,525	3,300—3,700	400	4
88	—	—	—	—	—	—
89	—	—	4,000	3,700—4,300	600	6
90	—	—	3,700	3,300—4,100	800	3
91	—	—	4,356	4,000—5,070	1,070	3
92	1	4,240	4,000	3,800—4,200	400	2
93	—	—	4,050	3,800—4,300	500	2
94	—	—	4,100	—	—	1
95	—	—	5,100	4,600—5,800	1,200	3
98	—	—	5,233	4,400—5,900	1,500	3
101	—	—	6,216	6,100—6,300	200	3
102	—	—	6,300	—	—	1
111	—	—	6,800	—	—	1
N.	501					344
Observateur =	Forest.		Letaconnoux			

Plie.

Observations sur les Stades jeunes de la Plie.

Dès le début de l'été, la Baie de l'Aiguillon au Nord de La Rochelle est peuplée d'un grand nombre de jeunes plies. Le 18 Juin, en 37 minutes de dragage avec un chalut à crevettes sur des fonds de 4 à 5 mètres, nous avons pu recueillir 123 individus dont 105 appartenaient au groupe 0 et dont la taille allait de 40 à 80 mm. (moyenne 57 mm.). Les 18 autres appartenaient au groupe I et mesuraient de 115 à 189 mm. (moyenne 162 mm.)[1])

Le 29 Juillet, dans la Baie de Morlaix (plage de Penpoull), nous avons pu mesurer un autre lot de jeunes plies appartenant toutes au groupe 0 et qui faisaient de 45 à 100 mm (moyenne 73 mm). Cette seconde capture fut faite à la senne sur la grève; nous n'avons trouvé aucun individu du groupe I.

	Gr. 0.					Gr. I.		
mm.	n	%	n	%	mm.	n	%
40	1	0·9	—	—	110	1	5
45	13	12·5	2	2.2	120	—	—
50	19	18·1	3	3·3	130	1	5
55	23	21·9	4	4·5	140	1	5
60	21	20·0	3	3·3	150	5	27
65	15	14·3	19	21·1	160	4	22
70	7	6·6	15	16·7	170	3	16
75	5	4·8	14	15·6	180	3	16
80	1	0·9	10	11·1			
85	—	—	8	8·9		18	100
90	—	—	5	5·5		(A)	
95	—	—	3	3·3			
100	—	—	4	4·5			
	105	100	90	100			
	(A)		(B)				

A. Echantillons du 18 Juin. B. du 29 Juillet.

[1]) Age déterminé d'après l'examen des otolithes.

R. Letaconnoux.

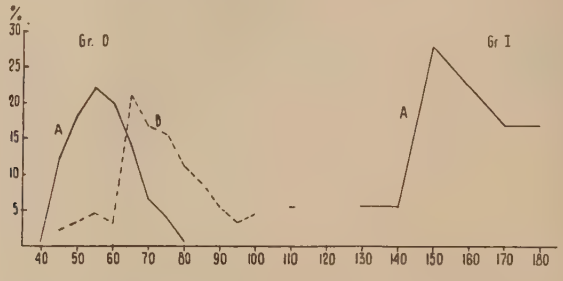

Fig. 1. Représentation graphique des tailles en mm. pour les groupes 0 et I le 18 Juin (A) et le 29 Juillet (B).

dine.

Cardine (*Zeugopterus megastoma*).

I. Répartition par Tailles.

Date:	Février 1946	Mars 1946	Septembre 46	Septembre 46
Origine:	46°N.3°20′W.G.	Grande Sole	S. E. Irlande Small's-Melville Jones Bank	Grande Sole
Nombre:	239	102	123	862
Tailles en cm.	fréquence %	fréquence %	fréquence %	fréquence %
15	—	1·00	—	—
16	0·5	—	—	—
17	0·5	1·00	—	1·05
18	2·5	—	—	4·05
19	6·3	1·95	—	5·8
20	5·85	3·9	—	4·65
21	5·00	11·75	—	2·1
22	5·85	11·75	—	2·3
23	8·35	7·8	—	0·7
24	9·6	8·8	—	1·4
25	5·45	8·8	—	0·7
26	3·35	2·95	3·25	1·15
27	4·2	6·85	3·25	1·25
28	2·9	4·9	6·5	2·65
29	3·75	1·95	4·9	5·45
30	2·9	1·00	5·7	5·7
31	0·8	3·9	1·65	6·95
32	0·8	—	4·05	5·55
33	4·2	1·95	9·75	8·6
34	5·00	1·95	4·05	5·45
35	5·45	1·95	7·3	6·85
36	1·65	—	10·55	5·9
37	2·5	1·00	8·15	6·15
38	1·65	2·95	6·5	3·5
39	2·5	1·00	3·25	3·00
40	1·65	1·00	2·45	1·65
41	2·5	2·95	5·7	1·65
42	0·5	—	3·25	0·8
43	2·5	1·00	2·45	0·45
44	0·5	—	—	0·8
45	0·8	—	2·45	0·45
46	—	1·00	—	0·7
47	—	1·00	0·8	0·95
48	—	1·00	—	0·35
49	—	—	2·45	0·7
50	—	1·95	—	0·35
51	—	—	—	0·25
52	—	—	0·8	—
53	—	1·00	0·8	—
	100·00	100·00	100·00	100·00
Modes	19—24—27 29—35—37 39—41—43	21—22—24 25—27—31 38—41	28—30—33 36—41—45 49	19—22—24 31—33—35 37—44—47 49
Moyenne	27·9 cm.	27·45 cm.	33·8 cm.	31·15 cm.
Observateur	Letaconnoux	Letaconnoux	Letaconnoux	Dizerbo et Fores

II. Croissance.

(Etablie suivant la répartition précédente et les résultats obtenus par Furnestin).

Origine		Taille modale à: 3 ans	4 ans	5 ans	6 ans	7 ans	8 ans
Golfe de Gascogne (Février 46)	cm.:	19	24	27—29	35—37	39—41	—
Grande Sole (Septembre 46)	cm.:	19	22—24	31—33	35—37	41—44	47—49

Observations: La représentation de chaque classe d'âge par deux modes, à partir de 4 ou 5 ans, s'explique par l'existence d'un dimorphisme sexuel portant sur la taille: à âge égal, les femell sont un peu plus grandes que les mâles (Furn stin. Rev. Trav. Office des Pêches Marit., VIII,

III. Corrélation Tailles et Poids

(en centimètres et en grammes) — Poisson vidé —

Taille	Observateur: Forest Poids moyen	Nombre	Observateur: Letaconnoux Poids moyen	Limites de variation	Nombre
17	33	9	—	—	—
18	40	35	—	—	—
19	47	50	—	—	—
20	54	40	—	—	—
21	63	18	—	—	—
22	73	20	—	—	—
23	80	6	—	—	—
24	95	9	—	—	—
25	105	3	—	—	—
26	128	5	135	115—150	4
27	176	3	157	145—170	4
28	172	4	170	155—185	8
29	182	13	187	170—205	6
30	194	22	200	170—230	7
31	204	26	222	215—230	2
32	233	22	252	230—265	5
33	250	30	262	230—295	12

Taille	Observateur: Forest Poids moyen	Nombre	Observateur: Letaconnou Poids moyen	Limites de variation	Nom bre
34	283	22	265	250—280	5
35	314	25	297	255—340	9
36	322	24	341	280—390	13
37	350	30	372	345—385	10
38	382	11	384	320—425	8
39	425	12	406	360—435	4
40	450	11	453	445—460	3
41	478	8	511	425—575	7
42	550	6	483	440—550	4
43	590	4	551	520—580	3
44	625	5	—	—	—
45	647	3	670	595—770	3
46	665	3	—	—	—
47	760	8	815	—	1
48	780	3	—	—	—
49	—	—	941	905—1000	3

Observations: Les résultats du tableau de gauche proviennent de pesées effectuées par groupes de tailles, tandis que ceux du tableau de droite sont dûs à des pesées individuelles des poissons.

Si l'on représente sur un graphique à coordonnées logarithmiques les poids à chaque taille, o obtient une droite dont la pente α est de 3·1: l poids s'accroît donc plus vite que le cube de l ·taille.

Dizerbo, Forest et Letaconnoux.

eng.

Sizes and Age-Groups of Irish Herring Samples 1946.

Locality	Date	Length in cms. expressed as Percentage of Sample										
		22	23	24	25	26	27	28	29	30	31	32
Howth	26/ 6 /46	1·6	4·0	9·7	19·5	32·5	19·5	11·3	1·6	—	—	—
,,	26/ 7 /46	—	1·1	4·7	17·0	22·8	35·6	14·8	3·7	—	—	—
,,	8/ 8 /46	0·7	1·4	2·8	14·2	25·0	32·1	19·2	4·2	—	—	—
,,	5/ 9 /46	0·7	3·5	7·8	28·5	30·0	25·0	4·2	—	—	—	—
Kinsale	16/10/46	—	—	1·1	2·9	1·1	12·2	18·7	23·3	22·2	15·7	2·3
,,	19/11/46	—	—	—	1·3	1·3	16·5	26·8	22·7	21·3	8·2	1·3

		Age-Groups as Percentage of Sample									
		2	3	4	5	6	7	8	9	10	11
Howth	26/ 6 /46	16·2	44·4	7·6	19·6	4·2	3·4	2·5	0·9	0·9	—
,,	26/ 7 /46	11·6	33·9	16·9	17·8	8·9	7·1	—	2·6	0·8	—
,,	8/ 8 /46	7·1	39·6	9·5	28·5	4·7	7·9	0·7	0·7	0·7	—
,,	5/ 9 /46	27·0	48·0	8·0	16·0	1·0	—	—	—	—	—
Kinsale	16/10/46	4·1	5·9	6·5	23·9	22·7	18·6	9·5	2·9	2·3	2·9
,,	19/11/46	2·1	10·8	12·2	28·0	14·3	12·9	10·8	7·9	—	0·7

G. P. Farran.

ne.

Sardine entre Loire et Gironde.

observations effectuées de Juin à Octobre montrent que dans la région du Golfe de me comprise entre Loire et Gironde, la pêche sardine portait sur deux groupes distincts:
p e I. D'importance numérique décroissante à Octobre, sa taille modale passe durant ne période de 120 à 150 mm. Sa moyenne ale est de 52·22 ± 0·163.
p e 0. Apparu en automne, il remplace peu les sardines du groupe I par des sardines ant deux modes distincts à 105 et 115 mm. la moyenne vertébrale est de 52·02 ± 0·177. sardines du groupe I, issues de pontes ont une taille à L_1 inférieure à celle du 0 issu de pontes de fin d'été (95 mm. 115 mm.). La moyenne vertébrale de l'ende ces sardines est de 52·14 ± 0·081.

R. Letaconnoux.

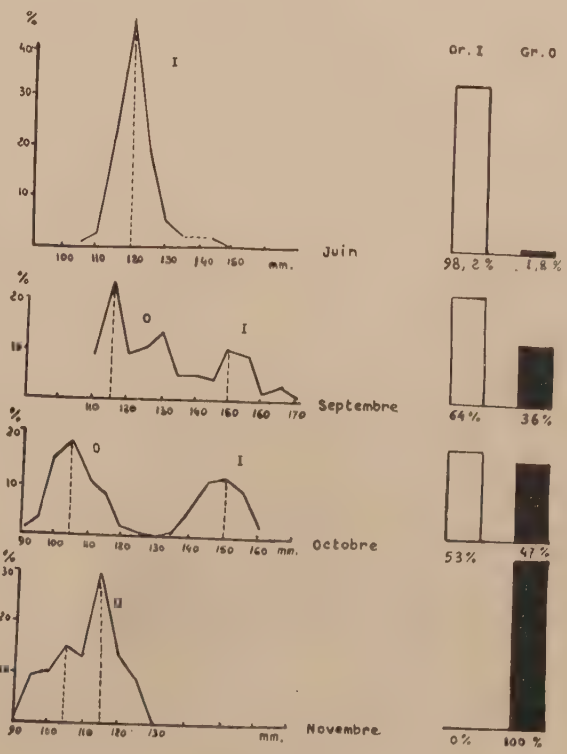

Fig. 2.
Modifications de la taille de la Sardine selon le mois.

Evolution du % de chaque groupe selon le mois.

Fréquence des Tailles en % selon le mois en 1946.

mm.	Juin	Sept.	Oct.	Nov.
90	—	—	1·0	1·7
95	—	—	2·9	8·3
100	—	—	15·6	10·8
105	0·5	—	17·5	14·1
110	2·6	8·8	12·2	13·3
115	22·0	22·5	7·5	28·4
120	46·0	8·8	2·7	13·4
125	18·2	10·0	0·8	9·2
130	5·5	12·5	0·2	0·8
135	2·6	5·0	1·7	—
140	—	5·0	4·4	—
145	2·1	3·7	10·3	—
150	0·5	10·0	11·8	—
155	—	8·8	8·5	—
160	—	1·2	2·9	—
165	—	2·5	—	—
170	—	1·2	—	—
	100·0	100·0	100·0	100·0

Tailles à L_1 des Sardines des Gr. I et

mm.	Gr. I	Gr. 0
70	1·0	—
75	0·5	—
80	2·8	—
85	14·8	—
90	21·4	0·7
95	23·3	3·6
100	14·3	10·9
105	12·9	15·2
110	5·7	17·4
115	1·4	23·2
120	1·9	13·8
125	—	9·4
130	—	4·4
135	—	0·7
140	—	0·7
	100·0	100·0
N.	210	138
m.	95 mm.	115 mm.

Fréquence du Nombre de Vertèbres en % selon les Groupes et pour la totalité des Sardines étudiées.

Nombre de vertèbres	50	51	52	53	54	Moy.	Fl	N.
Gr. I.	0	13·4	25·6	31·5	2·5	52·22	0·163	210
Gr. 0.	0	17·4	63·7	18·1	0·8	52·02	0·177	138
Total	0·1	14·7	57.1	26·9	1·2	52·14	0·081	765

Anchois.

Anchois du Golfe de Gascogne.

La moyenne vertébrale de l'anchois du Golfe de Gascogne a été définie comme suit:

Fage:	47·22 ± 0·290	N=74
Arné:	47·85 ± 0·34	N=70
Furnestin:	47·108 ± 0·096	N=509

Ces chiffres sont valables pour des lots prélevés dans la région de Saint Jean de Luz. Personnellement, en Septembre 1944, dans cette même région, nous avons relevé la moyenne de:

47·26 ± 0·205 N=100

En Octobre—Novembre 1946 nous avons répété la même analyse sur des échantillons venant de région entre La Rochelle et les Sables d'Olonne qui nous a donné la moyenne de:

46·90 ± 0·152 N=200

Cette dernière moyenne est franchement diff rente des moyennes précédentes qui sont toutes tr voisines (Fig. 3). Les tailles des deux lots q nous avons examinés étaient également dissembla les (Fig. 4).

Sans affirmer que l'anchois du nord forme u race différente de celle du sud du Golfe de G cogne, nous attirons l'attention sur cette questi que nous nous proposons d'étudier dans les anné à venir.

Letaconnoux.

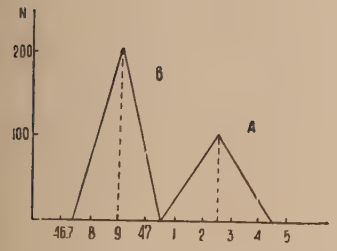

Fig. 3. Triangles de fluctuation de la moyenne vertébrale.
A — à St-Jean-de-Luz
B — à La Rochelle

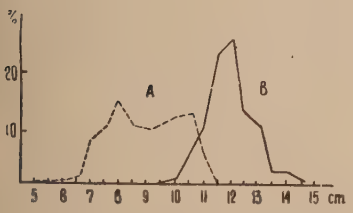

Fig. 4. Répartition des tailles.
A — à St-Jean-de-Luz (IX-1944)
B — à La Rochelle (X-XI-1946)

Fréquence des Tailles.

mm.	1944	1946
50	0·2	—
55	—	—
60	0·9	—
65	1·7	—
70	7.7	—
75	10·5	—
80	14·9	—
85	11·0	—
90	10·1	—
95	10·9	0·4
100	12·3	1·7
105	12·8	6·0
110	5·3	12·0
115	1·2	23·1
120	0·5	26·1
125	—	13·2
130	—	11·2
135	—	2·5
140	—	2·5
145	—	1·3
	100·0	100·0
N.	413	234

Nombre de Vertèbres de l'Anchois.

N.	1944	1946
45	—	0·5
46	8	23·0
47	59	63·5
48	32	12·5
49	1	—
50	—	0·5
	100	100·0

ereau.

aquereau du Golfe de Gascogne.

d'observations ont encore été faites sur la e du maquereau dans le Golfe de Gascogne. 1941 à 1943, les chalutiers travaillant entre et 47°10, par les fonds de 200 à 300 m. rent de petites quantités de maquereaux, en rincipalement. Ces captures dénotent dans gion la présence de concentrations de pré- ion analogues à celles que l'on voit débuter ême époque sur les fonds de 120 à 150 m. rée occidentale de la Manche.

les fonds chalutés, ces concentrations étaient relativement peu importantes, mais quelques coups donnés entre 120 et 150 m. montrèrent la présence de bancs plus considérables entre Février et Mai.

On relève encore en Octobre/Novembre la présence de maquereaux près des fonds ce qui complète l'analogie avec le comportement du maquereau de la Manche et de la Mer du Nord.

Sur les fonds de 150 m. on trouve en Mars des individus dont la taille est de 30 à 40 cm. et qui sont proches de la ponte. On a également relevé la présence de maquereaux de 21 à 27 cm. (1944).

Letaconnoux.

Apports Moyens de 1941 à 1943 par Mois et par Chalutier.

Mois	Kg.	%	Nombre de sorties
J.	0·5	—	47
F.	15·0	0·07	53
M.	263·0	1·20	56
A	15·0	0·08	55
M.	1·0	—	62
J.	—	—	49
J.	—	—	56
A.	—	—	59
S.	4·0	0·02	58
O.	3·0	0·02	62
N.	3·0	0·01	62
D.	—	—	67
m.	24·0	0·12	686

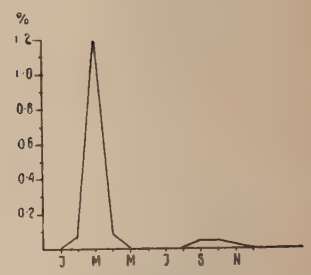

Fig. 5. Pourcentage de Maquereaux dans les apports au cours de l'année.

Mensurations du 6 au 24 Mars 1944.

cm.	N.	%
21	1	0·40
22	18	7·04
23	69	27·00
24	62	24·10
25	25	9·77
26	8	3·13
27	1	0·40
28	—	—
29	—	—
30	2	0·78
31	—	—
32	1	0·40
33	3	1·17
34	5	1·95
35	13	5·08
36	15	5·87
37	11	4·30
38	14	5·48
39	5	1·95
40	2	0·78
41	1	0·40
t.	256	100·00

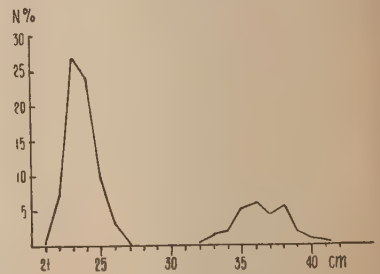

Fig. 6. Mensurations de Maquereaux en Mars 1944.

Argentine.

(Argentina sphyraena).

Au début de l'année 1946 nous avons rencontré des argentines en grand nombre au sud de l'Irlande. Par contre à la Grande Sole et à la Petite Sole elles étaient rares.

1. Sud de l'Irlande. 50°18. 9°25. 100 m. 1 Mars, 14 h. Température de l'eau à 30 m: 10°4.
2. Grande Sole. 50°17. 10°51. 340 m. 28 Février, 19 h. 30. Température de l'eau à 10 m: 11°2.
3. Petite Sole. 48°22. 9°06. 170 m. 5 Mars. 21 15. Température de l'eau en surface 11°7.

La plus grande abondance d'argentines se tr vait donc sur le plateau continental à des prof deurs de 100 à 120 m.

Toutes ces argentines, dont les tailles se ré tissaient entre 15 et 25 cm., étaient à un état maturité sexuelle avancé (stades V à VI), un individu au stade II mesurait 15 cm. En compagnie nous avons trouvé des jeunes immatu

à 10 cm. et allant vraisemblablement avoir

s tailles moyennes des lots 1 et 3 sont respec-ent de 21·1 et 19·7 cm. Ces deux lots doivent le même âge et la différence de leur taille ne s'explique par le fait que le premier est ut composé de ♀ et le second de ♂, les ♀ une taille moyenne supérieure à celle des ♂ contre 19·7 cm.).

moyenne vertébrale est de 52·62 ± 0·304.

Letaconnoux.

cm.	1	3	♂	♀
15	—	2	2	—
16	—	1	1	—
17	1	2	1	2
18	3	4	4	2
19	19	21	15	12
20	21	14	9	5
21	27	9	7	4
22	24	1	2	1
23	14	5	2	5
24	8	2	3	3
25	1	—	—	—
26	—	—	—	—
27	1	—	—	1
t.	119	61	46	35

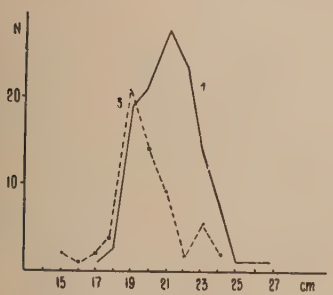

Fig. 7. Graphique des tailles.
Argentina sphyraena.

N. vertèbres		Etat sexuel	
51	1	II	1
52	23	III	—
53	26	IV	2
54	5	V	11
		VI	61
t.	55	t.	75

Grondin Gris.

Lesser Silver Smelt, Grey Gurnard

(Trigla gurnardus).

Répartition des tailles.

(en pourcentage)

Dates:	Juin 1945	Mars 1946
Origine:	Golfe de Gascogne (côte des Landes: 40 à 80 mètres) entre Saint-Girons et Mimizan	47° L.N. 4°30′ W.G.
Engin:	Chalut	Chalut
Nombre d'exemplaires:	138	573
Tailles en cm.:	Fréquence %	Fréquence %
11	0·75	—
12	—	—
13	0·75	—
14	1·45	—
15	0·75	—
16	13·75	—
17	36·95	—
18	30·40	—
19	9·40	—
20	2·15	0·70
21	2·15	0·50
22	0·75	1·05
23	0·75	1·05
24	—	3·00
25	—	2·10
26	—	4·00
27	—	5·40
28	—	8·55
29	—	11·70
30	—	10·10
31	—	10·80
32	—	11·15
33	—	11·40
34	—	7·65
35	—	6·45
36	—	2·30
37	—	1·75
38	—	0·35
	100·00	100·00
Moyennes	17·45 cm.	30·45 cm.
Modes	17	24—29—33 cm.
Observateur	Letaconnoux	Forest

Northern North Sea.

INVESTIGATIONS IN 1946.

The Scottish research vessel "Explorer" was commissioned in May and thereafter till December carried out combined hydro-biological and fishery cruises chiefly within the western sector of the North Sea and to the west of the Orkneys and Shetlands. Investigations were centred largely on trawling in order to obtain evidence from experimental hauls as to the actual condition of the stocks of fish for comparison with pre-war data and for confirmation of the commercial observations during the latter half of 1945. Mesh of net experiments were also carried out to test the effect on the haddock stock of the 80 mm. mesh which was laid down at the Overfishing Conference in March 1946 as the minimum for North Sea and adjacent waters.

Hydro-biological cruises across the northern gateway to the North Sea were made also by Danish and Norwegian research vessels.

Belgium, Denmark and Sweden sent out observers on commercial vessels operating the herring trawl on the Fladen and Gut grounds, samples of herring being retained for detailed examination ashore.

A. Environment.

The hydrographical conditions during 1946 were abnormal. Atlantic water did not penetrate the northern area in any considerable volume until the second half of the year and then mainly in subsurface layers. This resulted in a reversal of the usual south-going stream along the western sector of the North Sea and an effective closure to incoming water of the Orkney—Shetland passages. Bathythermograph readings on the Scottish summer herring grounds during the Asdic experiments established a sharp thermocline approximately at 30 metres depth over a wide area. Exotic oceanic plankton species were in abundance and widespread in the northern and central North Sea. The appearance in numbers of the jelly-fish *Pelagia perla* was most noticeable while doliolids were widespread and abundant. On the other hand, the medusa *Aurelia aurita* was conspicuous by its absence.

B. Fish Species.

1. Haddock. Age analysis established two year-classes of good survival, namely 1944 and 1945. The 1946 brood, however, so far as has been ascertained, is one of the poorest on record. The numbers of older and larger fish were much less than in 1945, the percentage of haddock over four years of age in the catches being almost negligible. This feature bears out previous observations on the high rate of mortality of the spawning stock. The poverty of the 1946 brood seems to have had some relation to the abnormal hydrographic conditions.

2. Lemon Soles. In comparison with pre-war catches, a higher percentage of large-sized fish was observed in the post-war period under review. Ten-year-old fish were predominant in commercial landings and seven-year-old fish in the experimental hauls. The brood of 1941 was fairly well represented, but that of 1940 showed poor survival.

3. Herring. In collaboration with the Ministry of Agriculture and Fisheries and through the courtesy of the Admiralty, experiments on the use of Asdic for spotting herring shoals were carried out during the year in the Clyde area and off the Scottish north-east coast. The results on the whole were encouraging and with further technical refinements, the apparatus should be a most useful commercial acquisition.

Apart from the two papers on racial studies included herein, little or no new research work of a biological nature was done on the fish themselves. The fishery of the local community of herring in the Firth of Forth was poor during the winter of 1945—6, while during the recent winter of 1946—7 it was a complete failure. The causes of the decline in this fishery are being investigated. The search for herring larvae on the east coast of Scotland was pursued energetically during the spring of 1947 but, so far, the results have been entirely negative. It is possible that abnormally cold water, as has been observed on the Norwegian coast, altered the migratory route of the adult spawning herring, but so far (May 1947), no definite information has been obtained as to their location.

As a sequel to the meeting of herring experts at Aberdeen, effect has been given to the preparation of twelve monthly charts showing the distribution of European herring, their spawning times and places, and the quality of the fish. Scale samples have also been interchanged between the various workers, while those workers who have not previously adopted racial methods are giving them a trial.

C. Fishing Gear.

Mesh of net experiments, especially the effect of an 80 mm. mesh on the stocks of fish, were carried out by the Scottish research vessels, and the haddock data have been prepared for presentation at the special meeting of the Council in October 1947, on the "Effect of the War on the Stocks of Fish."

R. S. Clark.

ENVIRONMENT.

Hydrographic Conditions at the Northern Entrance to the North Se in August 1946.

By

Jens Smed.

DURING August 24th and 25th, 1946, the Danish research vessel "Dana" under the leadership of Dr. Å. Vedel Tåning undertook hydrographic investigations along a line from Hellisö (Norway) to Unst (Shetland islands) — see Fig. 1. The data will be published in the *Bulletin Hydrographique pour les années 1940—1946*. A section showing isotherms and isohalines is given in Fig. 2. The positions of the stations are marked by vertical lines. Above each such line is indicated the number of the station, its position and the date when it was worked.

To find the current velocity perpendicular to the section as well as the water transport through the section dynamic calculations were carried out on the basis of the temperature and salinity data. In the diagram Fig. 3 the velocity values are recorded for the various intervals of depths between the stations. These values were based on the supposition that the zero-surface — i.e. the surface where the horizontal pressure gradient equals zero — for an interval between two stations is situated as indicated by the bottom line of the interval in the diagram. Positive values indicate current to the north.

Just below the bottom line in Fig. 3 is for each interval recorded a value for the intensity of the water flow through each interval. This value is in accordance with the stated current velocities. It will be seen that in the western part of the section an inflow to the North Sea of a little less than 1 km.^{3}/hour takes place. It should be emphasized that this is considerably more than the normal inflow. From calculations carried out by the au which are not yet published it will be seen tha normal inflow in the western part of the se amounts only to about 0·3 km.^{3}/hour. In the m part of the section there is no significant cu In the Norwegian channel, especially its ea part, the northgoing current reaches high vel values in the upper layers. The stated value

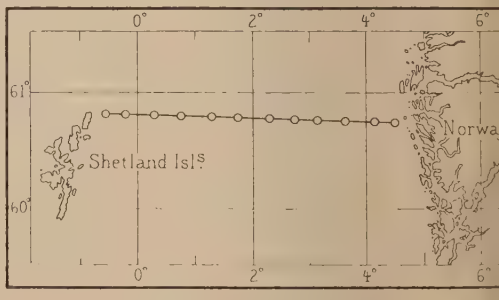

Fig. 1. Location of stations.

the intensity of flow through the channel ind a flow to the north amounting to about 1 k hour. This value should, however, be taken much reserve as one is probably not justifie taking the bottom as the zero-surface in the wegian channel. On the other hand the values the current velocities will not, however, be alt to any considerable degree by a reasonable shi the zero-surface.

Da 6412	Da 6411	Da 6410	Da 6409	Da 6408	Da 6407	Da 6406	Da 6405	Da 6404	Da 6403	Da 6402	Da 6401
25.VIII	25.VIII	25.VIII	25.VIII	25.VIII	25.VIII	25.VIII	25.VIII	25.VIII	24.VIII	24.VIII	24.VIII
60°48′ N.	60°48′5 N.	60°48′ N.	60°47′ N.	60°47′ N.	60°47′ N.	60°46′3 N.	60°46′ N.	60°46′N.	60°46′ N.	60°45′5 N.	60°46′N.
0°35′ W.	0°14′ W.	0°16′ E.	0°46′ E.	1°17′ E.	1°46′ E.	2°18′ E.	2°45′ E.	3°08′ E.	3°38′ E.	4°09′5 E.	4°31′ E.

Norway

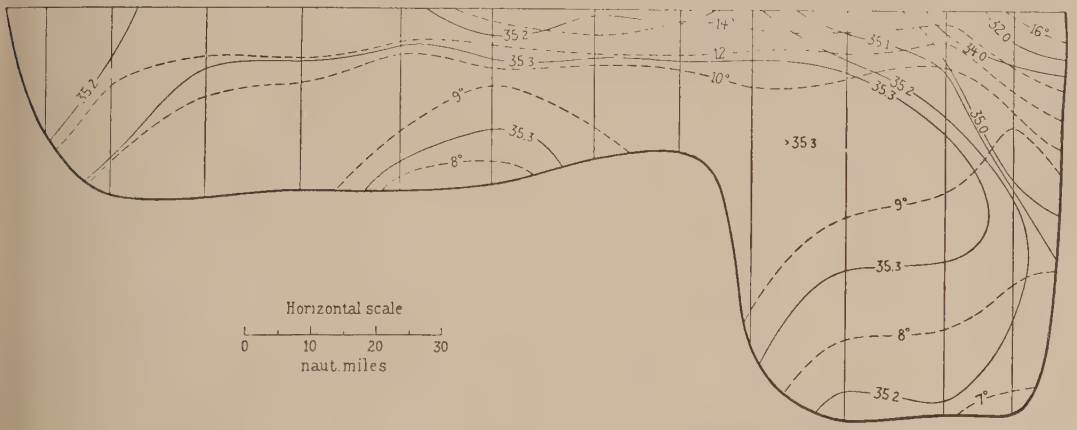

Fig. 2. Section giving isotherms and isohalines.

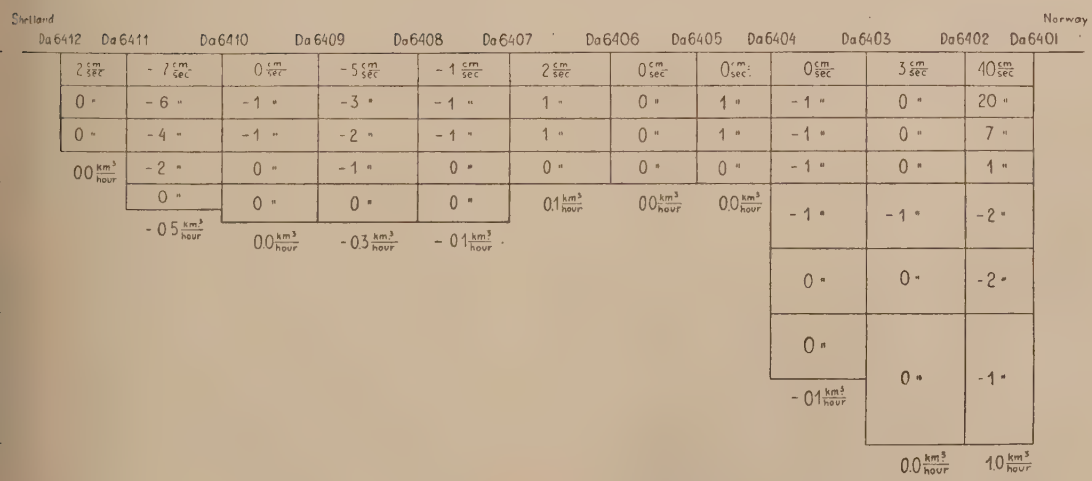

Fig. 3. Current and intensity of flow through the various parts of the section.
Positive values indicate current to the north.

Hydrography in Scottish Waters.

Consequent upon restrictions due to war aftermath, operations of the Scottish research vessel during 1946, from May to December, were confined to the nearer waters of the northern and central North Sea, the Faroe—Shetland Channel and off the west coast of Scotland. Temperatures and salinities from surface to bottom were recorded at 124 positions, and surface drift-bottles to the number of 590 were set adrift at selected points. 96 of these have been recovered to date and thanks are extended to Norwegian and Danish colleagues for their kind collaboration in these experiments.

In the Moray Firth area during the last week of May, sea temperatures from surface to bottom were about 1°C. above normal and salinities some 0·25 $^0/_{00}$ below average. There was no Atlantic water present even in the lowermost layers of the outer waters of the Firth where normally it is in evidence at this time of year.

These anomalies of temperature and salinity had diminished somewhat by mid-June in the outer Moray Firth area where there was still no evidence of Atlantic water at that period. Likewise in the Orkney neighbourhood, both to the eastward and westward, there was entire absence of oceanic influence in mid-June. Drift-bottle recoveries point to an anticyclonic circulation enveloping the whole island group, and temperatures and salinities indicate this to have comprised west Scottish coast, mixed with North Sea waters.

Some of this mixed water was traceable as far north as the Island of Foula, west of Shetland, where only the beginnings of oceanic influence were noted in sub-surface waters. Atlantic influence was more pronounced, though still sub-normal for the season, to the north-west and north of Shetland. Drift-bottle results for June in this area show a northward drift in operation from at least the Fair Isle region in latitude 59°30′N. to the western shores of Shetland. On the east side of Shetland oceanic characteristics were stronger than to the north and west of the group. There can be no question that Atlantic water entering the Northern North Sea at this period came by way of the north of Shetland; none can have had access through the openings between Shetland and the mainland of Scotland.

There was still no trace of Atlantic water in the outer Moray Firth, east Orkney and Fair Isle regions at mid-July, although temperatures continued above average. The Shetland area, on the other hand, from longitudes 4°W. to 2°30′E. and north of latitude 59°40′N. was flooded with high temperature but relatively low salinity Atlantic water down to between 300 and 400 metres. I ence of admixture with fresher water was ma to the north-west of Shetland out to mid-Cha where the average salinity in the uppermost metres scarcely exceeded 35·20 $^0/_{00}$ except a isolated position where 35·30 $^0/_{00}$—35·32 $^0/_{00}$ recorded.

All 28 drift-bottles recovered from July l ations along latitude 61°N. stranded on the of Norway. Routes embracing the Northern N Sea can definitely be ascribed to only two of drifters, but on the other hand, the remai along with both earlier and later liberat stranded all about the same period, namel October—November 1946. Some of these certa came from the North Sea and the weight of evid short of a detailed cartographical analysis o records, inclines towards the postulation of N ern North Sea routes for practically all of t The oceanic influx to the Northern North however, during the summer of 1946 appears from drift-bottle records and temperature salinity observations to have been a very poor compared with most years.

Relatively high temperatures were observe August in the sea areas west of Orkney and Outer Hebrides. Atlantic water much diluted present in sub-surface layers west of Orkney. I tion had undoubtedly come from west Sco coast waters where low salinities of 34·60 $^0/_{00}$ below were registered. Even to the westwar the Flannan Islands, practically on the contin edge, the concentration of oceanic water was f to be low. At more southerly stations off the C Hebrides the sub-surface layers were more decid oceanic in character, but dilution by fresher w was still much in evidence.

In the Central North Sea in September, of mid-east Scottish coast, only the outer sub-su waters showed signs of oceanic influence, wi thermocline established at about 30 metres' d At certain positions which would appear to been on the boundary of the mid-east Sco Coast Eddy, slightly sub-normal temperatures observed in the uppermost waters. Elsewhere peratures were nearly 1°C. above the average the season in this area.

During the month of October oceanic predominated at all depths in the north-we area of the North Sea from latitude 58°N. n ward, except in the Moray Firth area from w it was entirely absent. There was again evid from drift-bottle records of an anticyclonic cir tion round Orkney, and later recoveries on

ey and east and west Shetland shores point stakably to the operation during the last ter of the year of a large anticyclonic system acing almost the entire north-western area. ards the end of the year this system seems to extended southward at least to the Firth of a area, resulting in a reversal of the normal erly current all along the Scottish east coast. Salinities off the mid-east Scottish coast in November strongly suggest the indraught into that area and into the Moray Firth in the following month of indigenous Central North Sea waters, the whole mass tending northward as far as Shetland instead of, as ordinarily, passing south towards the Dogger Bank. This effect endured apparently until the middle of February, 1947.

John B. Tait.

Plankton in Scottish Waters.

Plankton samples were taken in Scottish waters n June to December 1946. Details of the macro-kton have been worked out from horizontal ections with 1 metre stramin nets, and the micro-kton from vertical hauls with Hensen, Hjort, ndard fine silk nets and from samples taken by plankton pump.

The most noteworthy feature of the year's kton was the extraordinary degree of penetra- into the Northern North Sea of the oceanic cies, *Dolioletta gegenbauri*, Rhincalanus, Euca- us, and *Pelagia perla*. These species reached as south as a line extending NE. from the Scottish der, and conditions in this area in September e such that doliolids were breeding there.

To the north-west, north and immediately east Shetland in July there was a community of anic species, including deep water and cold er forms as well as those from warm Atlantic er — *Sagitta maxima, S. lyra, S. serratodentata,* krohnia, *Ihlea (Salpa) asymmetrica, Diphyes artita,* Meganyctiphanes, etc. By October the na there had only slightly changed and the tribution of oceanic species was much the same in early summer, although some of the species re no longer present and others were reduced numbers (e.g. doliolids, Diphyes). A patch of ganyctiphanes was still present north-west of tland but numbers were much diminished east Shetland. *Sagitta maxima, S. lyra* and Eukroh- were still present. *Sagitta elegans*, which had n scarce in that area during the summer, was sent in abundance there in autumn.

The presence of *Pelagia perla* in profusion oughout the whole area affected by oceanic ter is unusual and was accompanied by the nmensal Amphipod *Hyperia galba. Aurelia ita* was almost entirely absent in the 1946 nkton in the area investigated. Off the east ttish coast in September *Sagitta elegans* was minant and was mixed with the oceanic fauna. *setosa* occurred in numbers only south of a line ending NE. from the Scottish border. There was ne mixing of the fauna in the region where the oming oceanic water abutted against the indigen- North Sea water, and in these places the North Sea fauna (*S. setosa, Corycaeus anglicus*, etc.) was generally near the surface and the oceanic fauna below.

The usual abundance of Stage V *Calanus finmarchicus* was found in early summer in the Faroe Channel and to the west of Shetland and Orkney and off the west coast of Scotland. Calanus was generally distributed over the North Sea area investigated but only in moderate numbers except in local areas. Pseudocalanus was common throughout the investigations. *Candacia armata* was more than usually abundant in the northern North Sea where it was associated with *Sagitta elegans.*

The main spring flowering of diatoms was largely past before sampling began, but a patch of mixed Chaetoceros spp. was found off Kinnaird Head in June. *Rhizosolenia alata* var. *gracillima* occurred to the north and east of Shetland in great abundance in July and with it were *Ceratium tripos* and the Radiolaria, Acanthochiasma and Acanthometron. Although the Rhizosolenia had become much reduced by September the Radiolaria persisted and could be traced into the North Sea where *Ceratium macroceros* was extremely common. *Guinardia flaccida* was extremely abundant, off the west and north coasts of Scotland, in August.

The absence of data from the spring months of the year means that the major spring spawning of fish was unassessed in the 1946 plankton. The summer figures of larval fish (clupeoids excepted) were much below those of 1939, although they were not seriously different from those of 1938. Lemon sole and hake were the dominant commercial fish larvae present; larval hake were, in fact, more numerous in 1946 than in either 1939 or 1938.

The earliest catch of autumn spawned larval clupeoids was at the Pentland Skerries in rectangle B 16 c in July, and large numbers were taken in August immediately west and north-east of the Orkneys, in rectangles A 16 b and B 17 d — much earlier than the records for 1939 and 1938. The total average of autumn-spawned clupeoid larvae was not very much less in 1946 than in 1938, which was a relatively good brood year for autumn spawning herring. No total figures from 1939 are available for comparison.

J. H. Fraser.

THE FISH SPECIES.

Lemon Soles.

The 'Explorer' records include fish caught in the small mesh covering the cod-end. On grounds to the south of Rattray Head only four small lemon soles were taken in the small mesh and in the Moray Firth only eight fish were so taken. Even if these captures are ignored it is clear that the average sizes of lemon soles taken by the research ship in the Moray Firth and on grounds south of Rattray Head are much smaller than the corresponding averages for commercially caught fish. Similarly the age analysis of both sets of data show the commercial catches to be generally older than those of the 'Explorer'. The explanation of this seems to be that the 'Explorer' operates both in territorial as well as in extra-territorial waters that the inshore grounds do not support the numbers of older and larger fish which are f on offshore grounds owing to the inshore gro having been fished throughout the war.

The commercial catches emphasize the im ance of the 1936 brood, particularly off the coast of Scotland, with the 1939 brood as a second. The 'Explorer' catches, on the other h show the 1939 brood as the outstanding one that of 1941 at least up to the average stre Both commercial and research vessel records with regard to the comparative poverty of the brood.

Table 1. Size Frequencies of Samples from Commercial Trawlers.

Locality		< 25 cm.	26—30	31 - 35	36—40	41—45	46—50	Total
S. of Rattray Hd.	No.	20	58	226	665	237	4	1210
	%	1·7	4·8	18·7	54·9	19·6	0·3	100·0
Moray Firth (Outer)	No.	10	22	56	115	36	—	239
	%	4·2	9·2	23·4	48·1	15·1	—	100·0
E. Orkneys, Fair Is.	No.	5	51	62	65	14	1	198
	%	2·5	25·8	31·3	32·8	7·1	0·5	100·0
North Coast	No.	4	27	44	34	3	—	112
	%	3·5	24·1	39·3	30·4	2·7	—	100·0

Table 2. Age Composition of Commercial Samples.

Broods	S. Rattray Head		Moray Firth		E. Orkneys, Fair Is.		North Coast	
	No.	%	No.	%	No.	%	No.	%
1943	21	1·8	1	0·4	—	—	—	—
1942	15	1·3	7	2·9	1	0·5	2	1·8
1941	40	3·4	13	5·4	16	8·1	6	5·4
1940	44	3·8	17	7·1	24	12·1	10	9·0
1939	241	20·9	46	19·3	36	18·2	27	24·4
1938	154	13·4	29	12·2	37	18·7	22	19·8
1937	169	14·7	29	12·2	25	12·6	17	15·3
1936	296	25·7	50	20·9	31	15·7	9	8·1
1935	92	8·0	22	9·2	16	8·1	9	8·1
1934	44	3·8	15	6·3	9	4·5	6	5·4
1933	32	2·8	8	3·3	1	0·5	1	0·9
1932	1	0·1	2	0·8	—	—	1	0·9
1931	2	0·2	—	—	1	0·5	—	—
1930	1	0·1	—	—	1	0·5	—	—
1929	—	—	—	—	—	—	—	—
1928	—	—	—	—	—	—	1	0·9
Total =	1152	100·0	239	100·0	198	100·0	111	100·0

Table 3. Size Frequencies of 'Explorer' Catches.

Locality		< 20 cm.	21—25	26—30	31—35	36—40	41—45	Totals
S. of Rattray Hd.	No.	4	22	65	92	58	16	257
	%	1·6	8·5	25·3	35·8	22·6	6·2	100·0
Moray Firth	No.	14	23	58	63	33	8	199
	%	7·0	11·6	29·1	31·7	16·6	4·0	100·0
Shetlands	No.	176	248	117	47	10	—	598
	%	29·4	41·5	19·5	7·9	1·7	—	100·0
North Coast	No.	14	17	15	15	7	1	69
	%	20·3	24·6	21·7	21·7	10·2	1·4	100·0

Table 4. Age Composition of 'Explorer' Catches.

Broods	S. of Rattrey Hd.		Moray Firth		Shetlands		North Coast	
	No.	%	No.	%	No.	%	No.	%
1945	—	—	—	—	1	0·2	—	—
1944	2	0·8	2	1·0	2	0·4	1	1·5
1943	21	8·9	22	11·2	35	6·6	6	8·7
1942	22	9·3	19	9·7	66	12·4	9	13·1
1941	45	19·1	35	17·9	104	19·6	8	11·6
1940	22	9·3	14	7·1	70	13·2	6	8·7
1939	66	28·0	43	21·9	160	30·1	11	16·0
1938	24	10·2	14	7·1	36	6·8	12	17·4
1937	11	4·7	18	9·2	27	5·1	4	5·8
1936	15	6·4	20	10·2	13	2·4	3	4·3
1935	2	0·8	5	2·6	7	1·3	4	5·8
1934	4	1·7	1	0·5	1	0·2	3	4·3
1933	2	0·8	2	1·0	4	0·7	1	1·4
1932	—	—	1	0·5	3	0·6	1	1·4
1931	—	—	—	—	2	0·4	—	—
Total =	236	100·0	196	100·0	531	100·0	69	100·0

Bennet B. Rae.

erring.

Observations diverses sur les Concentrations de Harengs du "Fladen" et du "Gut".

(Matériel prélevé en août et septembre 1946).

i. Pêcherie.

Il n'y a pas si longtemps que les chalutiers elges exploitent régulièrement les concentrations e harengs, qui, chaque année de juillet à octobre, pparaissent sur le "Fladen" situé dans la partie eptentrionale de la Mer du Nord et sur le "Gut" itué dans la partie centrale de cette mer.

Apports Annuels de Harengs		Chalutiers No.	Type de Navire	Force motrice C. V.
936	163,020 kg.			
937	1,856,235 „			
938	3,534,670 „			
939	6,264,665 „			
945	97,325 „			
–XI				
946	10,900,542 „	10	III	160—200
II—XII		25	IV	240—320
		12	V	480—850

La saison 1946 débuta fin juillet et dura jusqu'au 3 décembre. Toutefois au cours des mois de novembre et décembre le rendement de la pêche n'était déjà plus fort encourageant et la plupart des chalutiers s'étaient déjà retirés de cette exploitation.

Quant au déplacement de la pêcherie au cours de la campagne, tout indique que durant juillet et août nos pêcheurs exploitèrent exclusivement le "Fladen", mais qu'à partir de septembre nombre de chalutiers se tinrent déjà au sud de ce lieu de pêche. Aussi peut-on estimer, d'après des renseignements que nous avons obtenus directement des patrons pêcheurs, lors de l'enlèvement de nos échantillons d'étude, qu'après le 15 septembre tous nos chalutiers étaient déjà installés sur le "Gut" et ses environs.

Il est toutefois très difficile d'évaluer exacte-

ment pour combien ces deux régions interviennent chacune dans le poids total débarqué au cours de la saison. En effet, nos patrons pêcheurs indiquent invariablement la région du "Fladen" cor origine de leurs pêches, alors que tout au plu tiers de leurs apports y a été capturé.

Table 5. Répartition mensuelle des apports.

Mois	Nombre de navires	Nombre de voyages	Journées de pêche	Poids total débarqué	Poids moyen p. journée de pêche	C. V. dévelop-pés	Poids par journée pour 1 C.V. développé
Juillet	1	1	7	55,220	7,888	3,360	16·43
Août	23	46	208	2,618,266	12,588	82,145	31·87
Sept.	44	113	587	5,197,860	8,855	197,840	26·27
Oct.	35	72	427	2,725,083	6,382	174,980	15·57
Nov.	14	21	187	291,238	1,557	97,270	2·99
Déc.	4	4	29	12,875	444	14,400	8·94
Total	47	257	1,445	10,900,542	7,544	569,995	19·12

B. Statistiques biologiques.

Le matériel analysé comprend 14 séries d'échantillonnage qui comptent au total 643 harengs. 9 séries, ou 398 individus, ont le Fladen pour origine et 5 séries, ou 245 individus, le Gut. Tout le matériel a été prélevé en août et septembre: au Fladen: 8 échantillons en août et 1 en septem Au Gut: les 5 échantillons en septembre.

Le matériel recueilli sur les deux lieux pêche est traité séparément. Ce scindage permettre de vérifier si nous avons à faire à même communauté de harengs sur le Flade le Gut.

Tableau 6.

Longueur (recommandation d'Aberdeen 1946): Répartition pour 100.

cm.	20	21	22	23	24	25	26	27	28	29
Fladen	—	1·0	—	1·3	4·5	11·3	33·2	30·4	13·8	3·8
Gut	0·4	4·1	4·1	1·2	4·1	13·5	26·9	32·2	11·2	2·0
Fladen + Gut	0·1	2·2	1·6	1·2	4·3	12·1	30·8	31·1	12·7	3·1

Stades des Gonades (Signes de Hjort — Lowestoft 1930): Répartition pour 100.

Stades observés	I	II	III	IV	V	VI	VII	VIII-II	Mode
Fladen	1·3	1·8	9·3	22·9	58·0	4·3	1·0	1·5	V
Gut	2·9	1·4	6·1	12·6	60·8	13·9	2·4	0·8	V
Fladen + Gut	1·9	1·2	8·1	19·0	59·1	7·9	1·6	1·2	V

Quantité de Graisse mésentérique (Signes de Hjort): Répartition pour 100.

Graisse observée	0	1	+	M	Mode
Fladen	27·1	38·7	23·9	10·3	1
Gut	46·9	32·2	11·4	9·4	0
Fladen + Gut	34·7	36·2	19·1	9·9	1

Age — Fréquence des Classes de Recrutement: Répartition pour 100.

Anneaux d'Hiver	1	2	3	4	5	6	7	8	9	+	Mo
Age	2	3	4	5	6	7	8	9	10	+	d
Classes de Recrutement	1944	1943	1942	1941	1940	1939	1938	1937	1936	Antér.	nom d'ann
Fladen	—	2·1	6·7	11·0	23·9	15·3	11·6	13·2	9·5	5·2	5
Gut	1·7	8·8	14·6	12·3	24·0	12·3	8·8	7·6	3·5	4·1	5
Fladen + Gut	0·6	4·4	9·5	11·5	23·9	14·3	10·7	11·3	7·4	4·8	5

eau 6 (continué).

Age et Taille. Longueur moyenne. (en cm.)

Moyenne des harengs	(a) Mensurations au mm. Fladen	Gut	Fladen + Gut	(b) au cm. inférieur (correction + 0·5 cm.) Fladen	Gut	Fladen + Gut
Classe 1943	22·9	22·3	22·5	23·2	22·4	22·6
„ 1942	25·0	25·3	25·2	25·0	25·5	25·3
„ 1941	26·1	26·6	26·3	26·0	26·7	26·3
„ 1940	26·9	26·9	26·9	26·9	27·0	27·0
„ 1939	27·5	27·5	27·5	27·6	27·5	27·6

(Recommandation d'Aberdeen, afin de comparer les moyennes calculées d'aprés les deux méthodes; l'écart s'avère très minime ou même nul.)

Longueur de la première Zone de Croissance ou Valeur de L_1 (Méthode Lea).
Valeur moyenne de L_1 pour chaque classe de recrutement en mm.

Origine	Nombre d'anneaux d'hiver 2	3	4	5	6	7	8	9	Moyenne générale	Nombre d'individus
Fladen	119	118	122	120	129	114	113	107	118	322
Gut	112	119	123	119	130	119	108	103	119	166
Fladen + Gut	114	119	123	120	130	115	112	106	118	488

Vertèbres. Fréquence de chaque nombre de vertèbres: Répartition pour 100.

Nombre de Vertèbres	54	55	56	57	58	Nombre d'individus	Mode	Moyenne vertébrale
Fladen	0·7	6·0	43·5	44·7	5·0	398	57	56·4724
Gut	0·4	3·3	52·2	38·8	5·3	245	56	56·4531
Fladen + Gut	0·6	5·0	46·8	42·5	5·1	643	56	56·4650

Vertèbres cervicales ou hémaux à arc non clos.[1]) Fréquence de chaque nombre de vertèbres cervicales: Répartition pour 100.

Nombre	22	23	24	25	26	Nombre d'individus	Mode	Moyenne
Fladen	3·5	29·6	46·7	18·6	1·5	398	24	23·85
Gut	3·7	33·9	47·8	11·0	3·7	245	24	23·77
Fladen + Gut	3·6	31·3	47·1	15·7	2·3	643	24	23·82

[1]) Les risques de brisure de la pièce transversale du premier arc hémal ont pu être écartés. Après le premier arc hémal complètement clos ont n'a pas trouvé d'autre qui l'étaient incomplètement.

Tableau 7.

Récapitulation des Valeurs observées sur la Population de Harengs en 1946.

Observations	Fladen	Gut	Fladen + Gut
Longueur moyenne en cm. (Mensurations au mm.)	26·8	26·4	26·7
— (Mensurations au cm. inf. +0·5 cm.)	26·9	26·5	26·7
Mode de la taille	26	27	27
Poids moyen, en g.	156	144	152
Sexe. Pourcentage de mâles	54·5	47·4	51·8
„ femelles	45·5	52·6	48·2
Stades des gonades: mode	V	V	V
Graisse mésentérique: mode	1	0	1
Classes de recrutement: mode	1940	1940	1940
Valeur moyenne de L_1 calculée sur le lot (cm.)	11·8	11·9	11·8
Nombre de vertèbres: mode	57	56	56
moyenne	56·47	56·45	56·46
Nombre de vertèbres cervicales: mode	24	24	24
moyenne	23·85	23·77	23·82
Nombre d'estomacs avec contenu	23	64	87
Répartition pour 100	5·8	26·1	13·5

Ch. Gilis.

Table 8.
Biometric Observations on Herring caught in the western North Sea by Danish Cutters.

Locality	Date	Position		Depth, m.
Fladen	23/8	57°55′N Lat.	1°00′E. Long.	130
N. of W.-Dogger	28/9	55°30′N. „	1°45′W. „	79
E. of E. Bank, Dogger	30/9	54°40′N. „	3°05′W. „	37

Maturities (per cent).

Locality	Date	I	II	III	IV	V	VI	VII	VIII	Fish
Fladen	23/8	—	—	4	6	89	1	1	—	120
N. of W. Dogger	28/9	1	4	1	1	39	11	34	9	120
Dogger	30/9	—	—	—	—	80	3	15	2	120

Racial Characters.

Maturity / Locality	Date	I, II, III, IV			V, VI, VII, VIII		
		V. S.	V. P.	K_2	V. S.	V. P.	K_2
Fladen	23/8	56·6(10)	23·7(10)	14·8(6)	56·50(108)	23·73(108)	14·82(61)
N. of W. Dogger	28/9	57·0(8)	23·9(8)	15·0(8)	56·59(112)	23·95(112)	14·98(10)
Dogger	30/9	—	—	—	56·61(120)	24·02(120)	14·89(12)

Size Distribution.

cm.	19	20	21	22	23	24	25	26	27	28	29	30	Total
Fladen:													
Mat. III—IV	—	—	0·4	1	1	2	1	—	—	—	—	—	5
Mat. V—VII	—	—	—	1	5	15	29	33	9	2	—	0·4	94
Total	—	—	0·4	2	6	17	30	33	9	2	—	0·4	100
N. of W. Dogger:													
Mat. I—IV	0·4	1	2	2	—	—	1	—	—	—	—	—	6
Mat. V—VIII	—	—	1	3	4	6	15	25	26	11	2	0·4	93
Total	0·4	1	3	5	4	6	16	25	26	11	2	0·4	100
Dogger:													
Mat. V—VIII	—	—	—	—	2	3	18	35	29	11	2	—	100

Age Composition (per cent).

Years	1	2	3	4	5	6	7	8	9	10	11	12	Total
Fladen:													
Mat. II—III	—	1	—	4	1	0·4	—	—	—	—	—	—	6
Mat. V—VII	—	—	2	27	39	16	7	2	1	0·4	0·4	—	95
Total	—	1	2	31	40	16	7	2	1	0·4	0·4	—	101
N. of W. Dogger:													
Mat. I—IV	—	3	2	1	—	—	—	—	—	—	—	—	6
Mat. V—VIII	—	—	7	17	19	22	9	10	5	2	1	2	94
Total	—	3	9	18	19	22	9	10	5	2	1	2	100
Dogger:													
Mat. V—VIII	—	—	1	8	12	31	21	8	11	4	2	2	100

	Maturity V		
	V. S.	V. P.	K_2
N. f			
W ogger	56·72(47)	23·89(47)	14·95(37)
D ger	56·55(96)	23·99(96)	14·81(100)

	Maturities VI, VII, VIII		
	V. S.	V. P.	K_2
N f			
W ogger	56·49(65)	23·98(65)	15·00(64)
D ger	56·84(24)	24·12(24)	15·08(24)

The number of herring of maturities I, II, III ir IV investigated were too few to decide whether there is any racial difference between them and the mature spents and recovering spents.

The herring from the Fladen ground were of the northern type, while the samples from N.W. of Dogger, and from Dogger should be referred to the Downs herring according to their high V.S.

A closer examination of the sample caught N.W. of Dogger shows that the spawning and spents have a rather low V.S., only the maturing showing the very high number of V.S.

On the Dogger Bank the herring of Maturity VI, VII, and VIII (mostly spent herring) may seem to have a very high V.S. but the number investigated is too small to decide of the reality.

Aage J. C. Jensen.

Southern North Sea.

INTRODUCTION.

The contributors to this report on the Southern N th Sea area are:

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drography. Monthly mean salinity and tempera- e observations at surface and bottom taken at Vyl Lightvessel from October 1945 to Sep- ber 1946 are shown as anomalies from the rage over a longer series of years.

e Demersal Catch. Messrs. B o e r e m a and R o s e submitted figures from the Dutch fishery returns ich indicate that the 1946 catch per days absence s lower than in 1945. When fishing was resumed the middle of 1945 the density as shown by the ch per days absence of steam trawlers was very gh, but fell away sharply. During 1946, however, remained fairly constant at a level of about twice at found in 1933 and 1934. A general decline in size of most species was also noticed to take ace between the resumption of fishing after the r and the end of 1946.

aice. The population density of the plaice in the annel and the southern North Sea would be pected to have diminished as a result of the rease of fishing effort since the conclusion of stilities. The contributions from England and lland suggest that this has indeed been the case, population density in 1946 appearing to be ver than in 1945. The Dutch figures show a ady decline since the end of the war.

English and Danish results indicate that there been a tendency for length for age to increase the North Sea from 1945 to 1946. Dr. J e n s e n ds that in the nursery grounds off Esbjerg the e of plaice has much increased during the war l that this was particularly noticeable in 1946. the White Bank, Clay Deep, East Dogger and North Dogger grounds there was also an increase in size from 1945 to 1946, but this was not the case with the Puzzle Hole area. These increases were also found to apply to the relation between length and age except on the Dogger, NW. Dogger and Clay Deep areas. The age of fish over 27 cms. caught on the Esbjerg ground appears to have increased throughout the war and up to 1946.

For the Rye Bay area the English observations show a tendency for weight as well as length to have increased between 1941 and 1946. Unfortunately, there is no evidence as to the average weight and length of these fish in pre-war years, but information from the south-west North Sea, published in the English contribution to the special number of Rapp. et Procès Verb. on the effect of the war on the fisheries, shows that compared with the pre-war period, the younger year groups had increased in weight while the older ones had decreased.

Other Demersal Fish. Cod, haddock and sole all show varying degrees of decline in 1946 compared with 1945 when the Dutch figures are considered. For the whiting, however, this reduction in density is not shown by the Dutch fishery returns.

Herring. The 1946 East Anglian herring fishery was notable for fish that were longer than usual and more mature. The average landing, 59·6 crans at Lowestoft and 49·2 at Yarmouth compared with 64·8 and 58·7 in the previous year, give an idea of the decrease in density. The chief constituent of the fishery was the four-year old fish. This year-class born in 1942 was also the dominant one in the 1945—46 Belgien spent herring fishery dealt with by M. G i l i s, and was a notable constituent of the 1945 French fishery in the Dyck-Sandettie area.

It is important to note that the total yield of the Belgian spent herring fishery of 1945—46 declined from 26,358,947 kgm., compared with 31,445,760 in the previous season. The mean catch per horse power fell even more sharply from 159 to 68 kgm. This fall in density is likely to be due to the resumption of the East Anglian fishery where 354,389 cran were landed in 1946.

R. S. Wimpenny.

HYDROGRAPHY.

Monthly Mean of Salinity at Surface and Bottom at the Lightvessel "Vyl" for a longer Series of Years, and Anomalies from this Mean.

(From the Danish Meteorological Institute, Nautical Dept.).

	X	XI	XII		I	II	III	IV	V	VI	VII	VIII	IX
							Surface.						
Mean	32·4	32·4	32·9		32·6	32·4	32·2	32·4	32·3	32·6	32·5	32·4	32·
1945	—	—	—	1946	—0·7	0·6	0·7	—0·9	—0·4	—1·0	—0·7	—0·3	—0·
							Bottom.						
Mean	32·6	32·7	33·0		33·0	32·8	32·7	32·8	32·6	33·1	32·9	32·7	32·
1945	—	—	—	1946	—0·2	0·8	0·6	—0·9	0·2	—0·8	—0·5	0·0	0·

Monthly Mean of Temperature at Surface and Bottom at the Lightvessel "Vyl" for a longer Series of Years, and Anomalies from this Mean.

(From the Danish Meteorological Institute, Nautical Dept.).

	X	XI	XII		I	II	III	IV	V	VI	VII	VIII	IX
							Surface.						
Mean	12·2	8·5	5·4		3·2	2·2	2·6	4·8	8·8	12·4	15·2	16·1	15·
1945	—	—	—	1946	0·7	1·7	—0·3	—0·1	0·0	0·4	0·7	0·5	0·
							Bottom.						
Mean	12·7	9 0	6·2		3·9	2·6	3·0	4·7	7·9	11·1	14·1	16·0	15·
1945	—	—	—	1946	0·7	1·7	—0·6	—0·4	—1·3	0·2	—0·2	0·4	0·

Helge Thomse

THE FISH.

Plaice.

The Plaice in the open North Sea.

By

Aage J. C. Jensen.

A survey of the changes in the size composition of the plaice during the war and the contemporary changes in the age distribution and the length of the age-groups has been given in Ann. Biol. II.

Here the survey has been supplemented especially as to the age composition and average length of each of the age-groups at the nursery grounds off Esbjerg and the changes in the various parts of the North Sea have been followed down to 1946.

Size Composition.

The size of the plaice had increased very m during the war although not as much as m appear from the direct measurements of the pl landed: Normally the major part of the unders plaice caught are rejected on board, and the dif ence between the size distribution in 1936—37 later on can be explained partially from the dif ence in the size down to which the plaice v

Table 1. Off Esbjerg, 16—21 m.

mmercial landings, except May and July 1946, where undersized plaice were not rejected before the investigation. Percentage.

th m.	1936-37 IV-VI 17-21	1940 V 20-21	1941 VI 16-20	1945 IX 20	V 18-19	1946 VI 19	VII 16-20
of hes	3	5	11	1	2	1	3
5	40	16	22	12	8	0	21
-30	58	80	67	31	19	70	60
-35	2	4	10	36	43	28	18
-40	—	—	1	19	19	2	1
-45	—	—	—	2	5	—	—
-50	—	—	—	—	3	—	—
-55	—	—	—	—	3	—	—
	100	100	100	100	100	100	100
7							
-35	4	7	14	45	47	29	22
-40	—	—	2	24	21	2	3
-45	—	—	—	2	6	—	0·5
-50	—	—	—	—	3	—	—
-55	—	—	—	—	3	—	—
	4	7	16	71	80	31	25

cted on board, — although the official size ts for sale were the same, 260 mm., during e years. The size of mesh used in this area in e cases was a little smaller before the war than ater years. Yet the increase of the percentage plaice over 31 cm. in the sizes of more than m. landed (which are not influenced by differ- s in the rejecting of small plaice on board) cate that a change in the size composition of stock in the sea had begun already in 1940. *946 the change in most of the catches was very picuous, the larger sizes had become relatively h more numerous.* In the plaice over 27 cm. the percentage of plaice over 31 cm. in some catches from 1946 was about the same as in the first years of the war, in others it was more or less 5 times greater.

In both of the years compared in Table 2 all the plaice caught in these areas were more than 27 cm.

The increase in the length of the plaice stated in Ann. Biol., Vol. II, had continued from 1945 to 1946 except in the Puzzle Hole area. From this area we have no measurements from the former years to be compared with those from 1945—46 but there is no doubt whatever that the size of the plaice had increased also here during the war. No doubt this area has been one of the most heavily fished during the post-war years, and this fact may explain the difference in the development of the stock in this area as compared with the other areas covered by the investigation.

Age Composition of the Catches.

Owing to the above-mentioned difference in the rejecting of undersized plaice, and in the size of the mesh used, we have compared only the age distribution of the catches over 27 cm. In the pre-war years the age distribution varied from year to year according to the variations in the strength of the year-classes, yet the age distribution shown for 1936—37 may be taken as more or less normal for the pre-war years. In the first years of the war the plaice caught were rather young on account of the good and abundant year-classes from 1936 and 1937 following the bad year-classes of 1933—35 (comp. Tåning in Ann. Biol. I, Fig. 2, p. 137).

The years after the war are characterized by the deficiency of the 3-year-old plaice which fact in 1945 might be explained by the scarcity of the year-class 1942 (comp. Tåning, Ann. Biol. II, p. 53) while in 1946 it is found despite of the

Table 2. Size Composition of Catches outside the Nursery Grounds. Percentage.

Area	White Bank		Near Puzzle Hole		Clay Deep		East. part of Dogger		North of Dogger	
Year	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
Month	VI-VII	VI-VII	VIII	VII	VIII	VI	VI-VII	VII	VII	VII
Depth, m.	40-49	34-45	49	46	49	47	32-35	35	45	44
No. of catches	14	4	1	1	5	1	2	2	1	1
cm.										
26—30	10	4	3	10	2	2	2	—	1	—
31—35	57	38	53	53	38	17	26	14	10	11
36—40	29	41	37	30	43	51	38	41	41	35
41—45	3	12	6	6	15	25	22	34	32	28
46—50	0·2	4	1	1	3	4	8	10	12	14
51—55	—	0·5	0·2	—	1	1	3	—	4	5
56—60	—	0·5	0·2	—	0·2	—	1	—	0·3	5
61—65	—	0·4	—	—	—	—	—	—	—	1
	99	100	100	100	102	100	100	99	100	100

Table 3. Percentage Age Composition off Esbjerg, 16—21 m. of plaice over 27 cm.

Year	1936-37	1940	1941	1945	1946		Year-class
Month	IV-VI	V	VI	IX	V	VII	in
Depth, m.	17-21	21	16	20	18-19	16-20	1946
II	—	—	2	—	—	—	1944
III	*37*	36	24	6	—	1	1943
IV	26	*59*	*50*	30	1	17	1942
V	13	5	24	*43*	16	*69*	1941
VI	11	—	—	19	26	14	1940
VII	6	—	—	2	*29*	0·3	1939
VIII	7	—	—	—	14	—	1938
IX	—	—	—	—	7	—	1937
X	—	—	—	—	5	—	1936
XI+	—	—	—	—	3	—	1935—

rather good year-class of 1943. It must be remembered, that the fishery during the war was much more intensive in this area than in pre-war years, and for that reason we should have expected the average age of the stock to be rather low. *The rather high age of the plaice caught during the post-war years in this area must be explained by the diminished recruitment from the coastal area caused by the very slow growth there during the war.*

In each of the areas considered the 5, 6 and 7-year-old plaice (the year-classes 1939, 1940 and 1941) dominated the catches, at the eastern Dogger together with the year-class 1938. The scarcity of the 1942 year-class (the IV-group) corresponds to the fact, that this year-class was rather poor.

The new year-class 1941 entered the stock in the open North Sea in great quantities in 1945. When the common offshore movement of the stock during the summer had taken place it was shoaling in some places, the plaice of this year-class only afterwards mixing up with the older plaice. Thus in Aug.—Sept. 1945 the catches from the White Bank area investigated mainly consisted of this year-class, while the older ones were dominating in the catches from this area in June. Some of the older plaice during Aug.—Sept. of 1945 may have withdrawn from the area but no doubt many of them must have remained, and this fact warns against drawing conclusions when only a few catches are investigated. From the catches investigated in 1946 it seems that the mixing of the year-classes was much more pronounced in that year.

Length of the Age-Groups.

In Ann. Biol. II it was shown that the length of the age-groups in the White Bank area in some catches had not altered essentially during the war while in one catch here was found a considerable increase in the average length. On the other hand a decrease in the average length of each of the age-groups was found to the north of the Dogger f 1943 to 1945.

In Table 5 this most important point in development of the stock has been followed u 1946, and the investigation has been extende some other areas.

It must be noted that for this comparison plaice below 27·0 cm. have been excluded in catches from the areas off Esbjerg and White B since a fine-meshed seine was used before the especially on the nursery grounds, and more on account of the fact that more of the plaice be this size-limit were retained on bord before war while during and after the war almost all smaller plaice were rejected before landing. all the years we may be sure that practically plaice above 27 cm. have been rejected. The foll ing changes in the average lengths of the age-gro can be stated from Table 5:

1. On the nursery grounds off Esbjerg in de between 16 and 20 m. the average length of e age-group had increased in most catches, while one catch from July 1946 it was unaltered.

2. In the White Bank area the average len of the age-groups were very much greater t before the war.

3. Near Puzzle-Hole the size of each of age-groups in July 1946 was very much sma than in Aug. 1945, and about the same as in White Bank area in July 1946. The change fo here is possibly not characteristic for the area, may be due to the two random samples investiga since in one area there may be rather great dif ences between various shoals or patches on ground. Yet probability is in favour of the corr ness of a change as that found, in that this a was very little fished during the later years of war whereas fishing has been very intensive dur the most recent year. In other words: The size each age-group may have grown very large w the stock was spared and may have diminished the effect of the heavy fishing.

4. In the Clay-Deep area the average len of each of the age-groups has increased very m during the war.

5. On the Dogger Bank there has been no v great change in the average length of each a group yet perhaps there has been a tendency an increase. The sample from 1932 shown in table is from the central part of the Dogger w the samples analysed in 1945 and 1946 are fr the eastern part of the Bank. In a catch from eastern part of the Dogger from June 1932 found quite many small plaice below 27 cm. age determinations were carried out only on th of more than 29 cm. length. Most of the sma ones no doubt belonged to the IV-group (the r year-class 1928), and under this assumption average length of the plaice of more than 27

Table 4. Percentage Age Composition of Catches outside the Nursery Grounds.

Area	White Bank		Near Puzzle Hole		East. Dogger		North of Dogger		Year-Class in 1946
Year	1945	1946	1945	1946	1945	1946	1945	1946	
Month	VI	V-VII	VIII	VII	VI-VII	VII	VI-VII	VII	
Depth. m.	43-48	39-46	49	46	35	35	45	44	
III	—	1	0·4	—	1	1	—	—	1943
IV	13	10	17	2	10	3	7	—	1942
V	37	*35*	*38*	20	18	*31*	15	20	1941
VI	*41*	29	31	26	*43*	25	*42*	*27*	1940
VII	5	15	9	*32*	14	15	13	23	1939
VIII	2	5	3	11	9	16	12	8	1938
IX	2	2	1	5	3	5	5	7	1937
X	—	1	—	2	2	2	3	5	1936
XI+	—	2	1	2	1	2	2	10	—

Table 5. Average Length in cm. of the Age-Groups.

In brackets number of plaice investigated.

a: Off Esbjerg. Plaice over 27 cm.

	1936-37	1940	1941	1945	1946	
th	Apr.-June	May	June	Sept.	May	July
th, m.	17-21	21	16	20	18-19	16 20
	27·8 (18)	29·1 (50)	28·1 (55)	30·7 (24)	—	28·0 (13) 29·7 (77)
	27·5 (14)	—	28·6 (27)	34·5 (34)	33·8 (118)	28·7 (100) 30·8 (216)
	29·5 (17)	—	—	37·2 (15)	36·2 (38)	29·2 (33) 32·6 (14)

ite Bank Area. Plaice over 27 cm.

r	1935-37	1940	1941	1943	1945		1946	
ıth	June-July	Sept.	Aug.	June	June	Sept.	May	July
th, m.	38-49	34-47	45	43	43-48	42-49	46	39-45
	28·0 (36)	29·6 (107)	29·2 (57)	27·6 (111)	32·9 (24)	28·9 (243)	33·8 (10)	33·3 (49)
	28·9 (70)	31·5 (51)	30·0 (24)	29·2 (49)	34·2 (111)	30·7 (130)	35·1 (176)	34·2 (169)
	29·6 (43)	—	—	—	35·6 (184)	33·6 (39)	37·5 (95)	34·9 (172)
	28·9 (16)	—	—	—	38·7 (47)	—	41·4 (42)	36·9 (104)

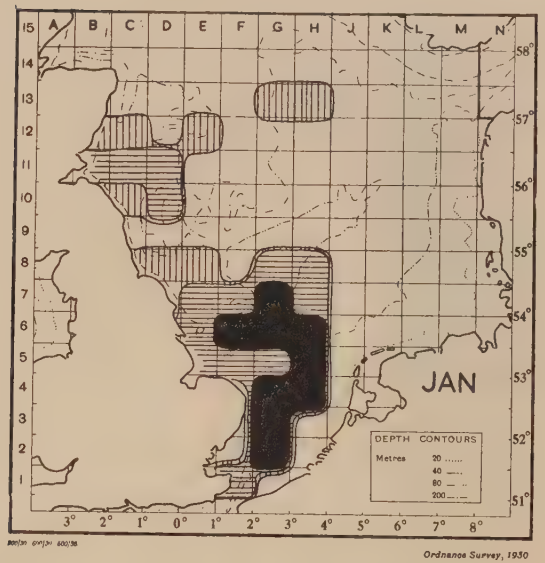
ious Areas.

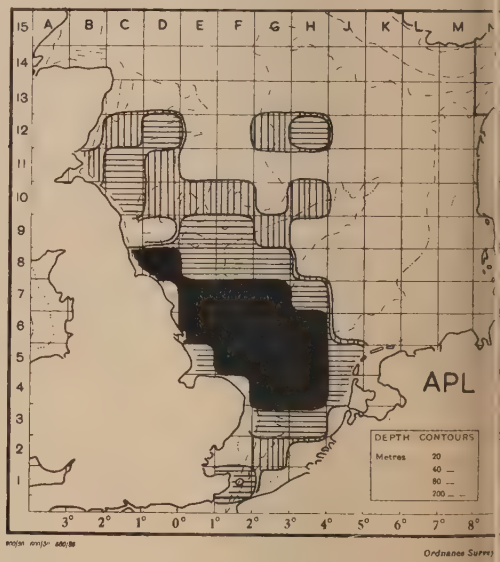
a	W. of Clay Deep				Near Puzzle hole		E. Dogger and Tailend					N. of W. Dogger	
r	1942	1944	1946		1945	1946	1932[1]	1945		1946		1945	1946
ıth	June-July	March	April	May	Aug.	July	May	June	Aug.	April	June		July
th, m.	40	47	40-43	39	49	46	23-32	35	30	28-38	35		44
	29·0	31·1	—	—	32·6	—	33·2	34·2	33·3	—	—	37·4	—
	(49)	(39)	—	—	(93)	—	(14)	(35)	(99)	—	—	(23)	—
	30·7	33·1	40·5	33·9	34·0	33·6	36·3	34·7	35·4	40·9	38·8	37·8	37·9
	(30)	(91)	(23)	(32)	(212)	(88)	(24)	(62)	(255)	(51)	(41)	(48)	(23)
	33·0	37·5	40·7	36·2	35·8	33·5	38·9	38·4	36·5	41·0	42·4	40·4	39·5
	(27)	(41)	(18)	(37)	(175)	(115)	(20)	(150)	(184)	(20)	(44)	(137)	(28)
	34·8	42·5	42·3	37·8	39·2	35·5	39·5	42·6	38·4	43·2	44·0	41·8	43·3
	(12)	(15)	(57)	(13)	(53)	(141)	(57)	(49)	(32)	(41)	(19)	(43)	(27)
I	—	—	44·0	—	—	38·0	—	—	—	—	—	44·0	43·6
	—	—	(15)	—	—	(50)	—	—	—	—	—	(39)	(10)

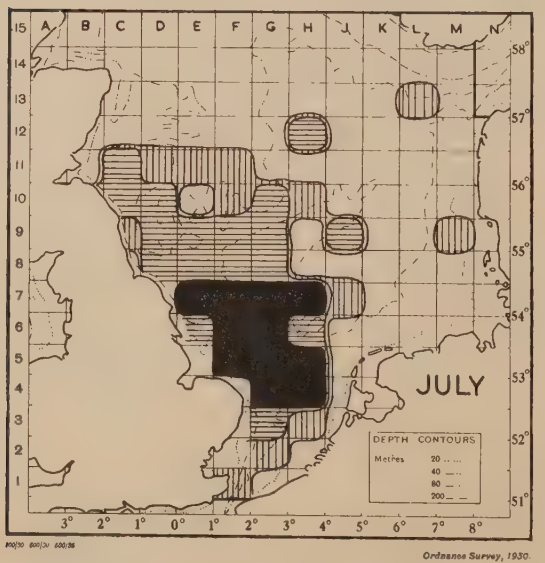
[1] Central part of Dogger.

in the sample from the eastern Dogger (32 m. depth) in June 1932 was more or less: IV-Gr. ca. 29·5 cm., V-Gr. 36 or 36·5 cm., and VII-Gr. 39·0 cm. With the exception of the small average length of the IV-Gr. the lengths correspond to those found for the central Dogger in the same year, or a little less than the lengths found in area in most of the catches from 1945 and 194

6. North of the Dogger Bank, where the len had decreased from 1943 to 1945, they were 1946 about the same as in 1945, and practic the same as on the Dogger Bank.







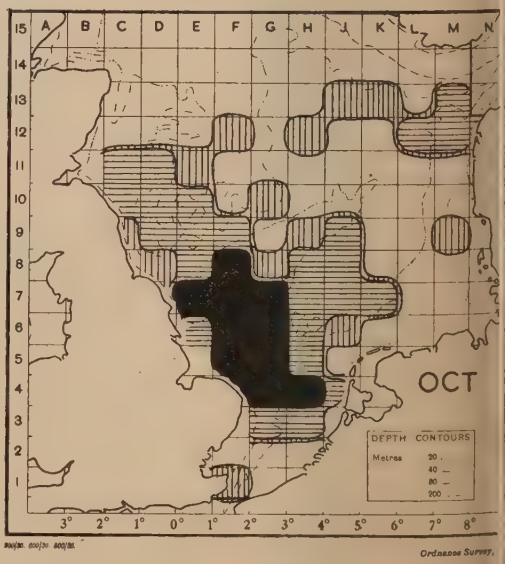


Fig. 1. Total Landings of 1st class English Steam Trawlers for the North Sea in the months of January, April, Jul and October. The areas covered by vertical lines indicate landings recorded, the horizontal lines over 100 cwts., and th black over 1,000 cwts.

The English Plaice Fishery in the Southern North Sea and English Channel in 1946.

By

R. S. Wimpenny.

DURING 1946 trawling by English fishing vessels was extending continuously as the mined areas were gradually cleared. The ent to which this was the case in the plaice hery is shown in Figure 1, where the total dings of 1st class steam trawlers for the various tistical areas in the months of January, April, y and October are shown to have spread well the eastward as the year went on. Parallel to s there was an increase of the fishing fleet as wlers were released from war service, recondi- ned, and returned to their owners. For instance, Grimsby in the first weeks of January, April, ly and October there were 90, 135, 140 and 167 class steam and motor trawlers at work. At westoft comparable figures for the beginning of se months were 63, 94, 110 and 88, the drop the last month being due to the seasonal turn- er of drifter trawlers to herring drifting. In the e Bay area, however, where an inshore trawl hery by small motor boats had flourished and reased throughout the war, the local fleet had minished, the number of petrol or petrol-paraffin opelled trawlers working from Hastings, Rye, d Dungeness in January, April, July and Octo- r being 66, 97, 59, 50.

Size of Fish measured at Grimsby, Lowestoft, Rye and Hastings Markets.

Plaice were measured at Grimsby, Lowestoft, ye and Hastings markets during the year, the gures being given in Tables 1 and 2 and set out quarterly mille length-frequencies in Figure 3. ne numbers measured at Grimsby and Lowestoft 58,026 and 76,086) were considerably greater an those for the Rye Bay ports (18,555).

The Grimsby and Lowestoft measurements have en divided into two lots, firstly those taken from atistical areas G 3, G 4, H 3 and H 4 — a ound immediately east of Lowestoft (see Figure 2) d secondly, those from statistical areas F 6, F 7, G 6, G 7, H 6 and H 7 — a ground to the north of the first and in the latitude of Grimsby.

The Rye Bay data refers to the catch taken in Rye Bay and differs from the southern North Sea ports in that the measurements were not made continuously throughout the year, but on the four quarterly visits of the fishmeasurer. Another difference to be noted lies in the size of the mesh. The inshore boats of the Rye Bay area generally used the legal "inshore" mesh of 30 rows to the yard, or about 60 mm. mesh length, whilst the cod-end mesh of the Lowestoft and Grimsby 1st class trawlers was 24 rows to the yard, or about 70 mm. mesh length.

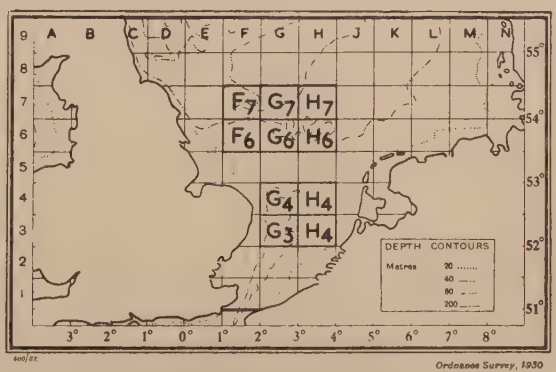


Fig. 2. Chart showing the Statistical Areas of the Southern North Sea from which the data in this paper have been taken.

The figures from all sources show interesting seasonal differences. In Rye Bay the fish were longest in the first quarter, becoming successively smaller as the season progressed. On the other hand in the southernmost of the North Sea areas, length in the first two quarters remained much the same, but smaller fish appeared in the third and fourth quarters. Finally, in the more northerly of the North Sea areas the longer fish were found in the first quarter. In the second and third quarters the

Table 1. Plaice Length-Frequencies as number sampled and distribution as percentages in each quarter of 1946 from Rye Bay, Lowestoft and Grimsby landings, Statistical Rectangles G3, G4, H3, H4 and F6, F7, G6, G7, H6, H7.

1946 Length (cm.)		20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Rye Bay																								
1st.		—	—	1	5	10	18	23	57	57	61	89	91	111	128	167	247	341	366	356	355	246	248	182
		—	—	0·0	0·1	0·3	0·5	0·6	1·6	1·6	1·7	2·4	2·5	3·0	3·5	4·6	6·8	9·4	10·0	9·8	9·8	6·8	6·8	5·0
2nd.		—	—	2	16	64	116	174	185	164	200	202	268	298	246	261	191	187	168	126	123	68	48	35
		—	—	0·1	0·5	2·0	3·6	5·4	5·8	5·1	6·2	6·3	8·4	9·3	7·7	8·2	6·0	5·8	5·3	3·9	3·8	2·1	1·5	1·1
3rd.	Quarter	1	19	43	82	258	341	551	745	849	923	765	705	488	353	278	173	117	107	52	27	33	18	10
		0·0	0·3	0·6	1·2	3·7	4·9	7·9	10·7	12·2	13·3	11·0	10·1	7·0	5·1	4·0	2·5	1·7	1·5	0·8	0·4	0·5	0·3	0·1
4th.		—	2	18	195	366	508	510	405	309	282	226	200	167	135	128	91	48	40	31	32	21	14	8
		—	0·1	0·5	5·2	9·7	13·5	13·6	10·8	8·2	7·5	6·0	5·3	4·4	3·6	3·4	2·4	1·3	1·1	0·8	0·8	0·6	0·4	0·2
Grimsby and Lowestoft																								
1st.		—	3	25	78	197	317	511	779	1017	1412	1861	2474	3094	3714	3771	3399	2891	2430	2088	1781	1510	1319	936
		—	0·0	0·1	0·2	0·5	0·8	1·3	2·0	2·6	3·6	4·8	6·3	7·9	9·5	9·7	8·7	7·4	6·2	5·3	4·6	3·9	3·4	2·4
2nd.		—	6	9	42	122	236	365	573	766	1063	1416	1844	2151	2645	2731	2579	2173	1917	1647	1337	1162	852	640
		—	0·0	0·0	0·2	0·4	0·8	1·3	2·1	2·8	3·8	5·1	6·6	7·7	9·5	9·8	9·3	7·8	6·9	5·9	4·8	4·2	3·1	2·3
3rd	Quarter	—	7	42	159	461	916	1403	1735	1769	1926	2056	2154	2278	2576	2765	2716	2383	2269	1872	1663	1412	1096	735
		—	0·0	0·1	0·4	1·2	2·5	3·8	4·7	4·8	5·2	5·6	5·8	6·2	7·0	7·5	7·4	6·5	6·1	5·1	4·5	3·8	3·0	2·0
4th.		1	3	21	119	351	745	1113	1389	1710	1636	1665	1712	1610	1690	1917	1847	1715	1490	1294	1117	1101	912	643
		0·0	0·0	0·1	0·4	1·2	2·6	3·9	4·8	6·0	5·7	5·8	6·0	5·6	5·9	6·7	6·4	6·0	5·2	4·5	3·9	3·8	3·2	2·2
Regions G3, G4, H3, H4																								
1st.		—	2	16	38	86	154	204	352	425	582	819	1199	1537	1982	1986	1684	1407	1084	849	574	478	317	246
		—	0·0	0·1	0·2	0·5	0·9	1·2	2·1	2·5	3·4	4·9	7·1	9·1	11·7	11·8	10·0	8·4	6·4	5·0	3·4	2·8	2·2	1·5
2nd		—	3	4	13	47	63	108	159	216	286	431	588	663	909	870	799	639	528	445	333	295	195	135
		—	0·0	0·1	0·2	0·6	0·8	1·4	2·0	2·7	3·6	5·4	7·3	8·3	11·3	10·9	10·0	8·0	6·6	5·6	4·2	3·7	2·4	1·7
3rd	Quarter	—	4	16	62	194	383	548	642	573	636	640	684	676	728	710	693	574	470	437	413	299	194	138
		—	0·0	0·2	0·6	1·9	3·8	5·5	6·4	5·7	6·4	6·4	6·9	6·8	7·3	7·1	7·0	5·8	4·7	4·4	4·2	3·0	1·9	1·4
4th.		—	3	8	48	135	239	372	426	511	470	429	475	474	519	579	563	534	423	344	302	280	239	149
		—	0·0	0·1	0·6	1·7	3·0	4·7	5·4	6·5	5·9	5·4	6·0	6·0	6·6	7·3	7·1	6·8	5·4	4·4	3·8	3·6	3·0	1·9
Regions F6, F7, G6, G7, H6, H7																								
1st.		—	—	3	8	34	62	116	193	253	442	560	640	840	924	981	1014	918	831	784	792	683	667	479
		—	—	0·0	0·1	0·3	0·5	0·9	1·5	1·9	3·3	4·2	4·8	6·4	7·0	7·4	7·7	6·9	6·3	5·9	6·0	5·2	5·0	3·6
2nd		—	2	4	17	50	113	147	252	292	381	406	558	650	753	852	732	631	540	430	340	281	226	154
		—	0·0	0·1	0·2	0·6	1·4	1·8	3·1	3·5	4·6	4·9	6·8	7·9	9·1	10·3	8·9	7·7	6·6	5·2	4·1	3·4	2·7	1·9
3rd	Quarter	—	1	15	25	85	185	247	340	383	483	491	585	651	775	841	788	693	597	514	442	381	302	208
		—	0·0	0·2	0·3	1·0	2·2	2·9	4·0	4·5	5·7	5·8	6·9	7·7	9·1	9·9	9·3	8·1	7·0	6·0	5·2	4·5	3·5	2·4
4th.		—	3	8	48	135	239	372	426	511	470	429	475	474	519	579	563	534	423	344	302	280	239	149
		—	0·0	0·1	0·6	1·7	3·0	4·7	5·4	6·5	5·9	5·4	6·0	6·0	6·6	7·3	7·1	6·8	5·4	4·4	3·8	3·6	3·0	1·9

2nd. Quarter	18	16	7	9	2	3	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3,200
	0·6	0·5	0·2	0·3	0·1	0·1	0·1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3rd. Quarter	9	4	2	3	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6,959
	0·1	0·1	0·0	0·0	0·0	0·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4th. Quarter	8	4	1	3	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3,756
	0·2	0·1	0·0	0·1	0·1	0·1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Grimsby and Lowestoft																									
1st. Quarter	812	558	403	292	230	192	176	194	149	98	103	71	58	29	37	23	21	10	5	3	1	1	—	—	39,073
	2·1	1·4	1·0	0·7	0·6	0·5	0·4	0·5	0·4	0·2	0·3	0·2	0·1	0·1	0·1	0·1	0·1	0·0	0·0	0·0	0·0	0·0	—	—	—
2nd. Quarter	393	344	211	182	123	97	70	33	41	23	21	12	8	9	7	6	2	1	1	—	—	—	—	—	27,860
	1·4	1·2	0·8	0·7	0·4	0·4	0·3	0·1	0·1	0·1	0·1	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	—	—	—	—	—	—
3rd. Quarter	518	407	271	213	168	151	130	140	105	88	68	59	42	47	32	29	12	15	10	7	2	3	1	2	1	36,914
	1·4	1·1	0·7	0·6	0·5	0·4	0·4	0·4	0·3	0·2	0·2	0·2	0·1	0·1	0·1	0·1	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	—
4th. Quarter	528	345	267	281	193	187	168	153	139	132	127	85	86	64	56	45	25	19	10	7	4	3	1	3	—	28,729
	1·8	1·2	0·9	1·0	0·7	0·6	0·6	0·5	0·5	0·5	0·4	0·3	0·3	0·2	0·2	0·2	0·1	0·1	0·0	0·0	0·0	0·0	0·0	0·0	—	—
Regions G3, G4, H3, H4																									
1st. Quarter	185	134	94	55	49	34	41	50	27	27	19	14	11	10	9	5	8	1	1	1	—	1	—	—	—	16,851
	1·1	0·8	0·6	0·3	0·3	0·2	0·2	0·3	0·2	0·2	0·1	0·1	0·1	0·1	0·1	0·0	0·1	0·0	0·0	0·0	—	0·0	—	—	—	—
2nd. Quarter	90	59	33	25	14	18	17	3	8	3	2	3	2	—	—	1	—	—	—	—	—	—	—	—	—	8,007
	1·1	0·7	0·4	0·3	0·2	0·2	0·2	0·0	0·1	0·0	0·0	0·0	0·0	—	—	0·0	—	—	—	—	—	—	—	—	—	—
3rd. Quarter	89	56	28	27	10	11	9	6	6	1	1	2	—	—	—	3	—	—	—	—	—	—	—	—	—	9,963
	0·9	0·6	0·3	0·3	0·1	0·1	0·1	0·1	0·1	0·0	0·0	0·0	—	—	—	0·0	—	—	—	—	—	—	—	—	—	—
4th. Quarter	94	64	47	41	30	23	17	23	6	11	10	6	1	4	3	2	—	1	1	—	—	—	1	—	—	7,907
	1·2	0·8	0·6	0·5	0·4	0·3	0·2	0·3	0·1	0·1	0·1	0·1	0·0	0·1	0·0	0·0	—	0·0	0·0	—	—	—	0·0	—	—	—
Regions F6, F7, G6, G7, H6, H7																									
1st. Quarter	432	320	217	177	126	115	98	119	105	59	74	45	37	16	25	16	12	7	4	1	1	—	—	—	—	13,230
	3·3	2·4	1·6	1·3	1·0	0·9	0·7	0·9	0·8	0·4	0·6	0·3	0·3	0·1	0·2	0·1	0·1	0·1	0·0	0·0	0·0	—	—	—	—	—
2nd. Quarter	72	103	56	51	30	40	24	9	14	6	4	5	3	2	2	1	1	—	—	—	—	—	—	—	—	8,234
	0·9	1·2	0·7	0·6	0·4	0·5	0·3	0·1	0·2	0·1	0·1	0·1	0·0	0·0	0·0	0·0	0·0	—	—	—	—	—	—	—	—	—
3rd. Quarter	166	131	85	57	35	43	30	29	24	9	12	8	8	6	—	4	2	2	4	—	—	—	—	—	—	9,731
	1·7	1·4	0·8	0·6	0·4	0·4	0·3	0·3	0·2	0·1	0·1	0·1	0·1	0·1	—	0·0	0·0	0·0	0·0	—	—	—	—	—	—	—
4th. Quarter	234	152	136	152	112	113	109	102	102	101	95	69	78	51	47	36	23	15	7	6	3	3	—	1	—	8,950
	2·6	1·7	1·5	1·7	1·2	1·3	1·2	1·1	1·1	1·1	1·1	0·8	0·9	0·6	0·5	0·4	0·3	0·2	0·1	0·1	0·0	0·0	—	0·0	—	—

Table 2. Plaice Length-Frequencies as number sampled and distribution as pe

Length (cm.)	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	4
Regions G3. G4. H3. H4.																					
January	—	6	8	32	41	54	88	127	186	295	396	551	726	783	641	546	463	344	243	208	1
	—	0·1	0·1	0·5	0·6	0·8	1·4	2·0	2·9	4·6	6·2	8·6	11·3	12·2	10·0	8·5	7·2	5·4	3·8	3·2	
February	1	5	12	26	44	57	101	133	189	233	396	453	600	598	515	460	333	261	184	144	1
	0·0	0·1	0·2	0·5	0·9	1·1	2·0	2·6	3·6	4·5	7·6	8·7	11·6	11·5	9·9	8·9	6·4	5·0	3·5	2·8	
March	1	5	18	28	69	93	163	165	207	291	407	533	656	605	528	401	288	244	147	126	
	0·0	0·1	0·3	0·5	1·3	1·8	3·1	3·2	3·9	5·6	7·8	10·2	12·5	11·6	10·1	7·7	5·5	4·7	2·8	2·4	
April	1	2	6	22	27	49	72	96	128	215	282	307	358	336	292	218	185	117	91	65	
	0·0	0·1	0·2	0·7	0·9	1·6	2·4	3·2	4·3	7·1	9·3	10·2	11·9	11·1	9·7	7·2	6·1	3·9	3·0	2·2	
May	2	2	6	15	22	45	59	88	111	144	199	204	330	299	277	220	172	202	143	125	
	0·1	0·1	0·2	0·5	0·7	1·5	2·0	3·0	3·8	4·9	6·8	7·0	11·3	10·2	9·5	7·5	5·9	6·9	4·9	4·3	
June	—	—	1	10	14	14	28	32	47	72	107	152	221	235	230	201	171	126	99	105	
	—	—	0·0	0·5	0·7	0·7	1·4	1·6	2·3	3·5	5·2	7·4	10·7	11·4	11·2	9·8	8·3	6·1	4·8	5·1	
July	1	4	11	36	55	82	106	89	118	147	188	228	246	237	274	213	170	166	169	144	
	0·0	0·1	0·4	1·2	1·9	2·8	3·6	3·0	4·0	5·0	6·3	7·7	8·3	8·0	9·2	7·2	5·7	5·6	5·7	4·9	
August	1	5	26	92	202	270	278	263	319	296	320	299	322	306	281	232	194	182	160	94	
	0·0	0·1	0·6	2·1	4·7	6·2	6·4	6·1	7·3	6·8	7·4	6·9	7·4	7·1	6·5	5·3	4·5	4·2	3·7	2·2	
September	2	7	25	66	126	196	258	221	199	197	176	149	160	167	138	129	106	89	84	61	
	0·1	0·3	1·0	2·5	4·8	7·4	9·7	8·3	7·5	7·4	6·6	5·6	6·0	6·3	5·2	4·9	4·0	3·4	3·2	2·3	
October	2	8	26	98	175	281	310	372	341	285	313	271	266	294	270	244	200	182	126	122	
	0·1	0·2	0·6	2·2	4·0	6·3	7·0	8·4	7·7	6·4	7·1	6·1	6·0	6·6	6·1	5·5	4·5	4·1	2·8	2·8	
November	1	—	14	18	27	32	53	64	44	55	53	58	83	90	90	86	58	54	46	27	
	0·1	—	1·3	1·7	2·6	3·1	5·1	6·1	4·2	5·3	5·1	5·6	7·9	8·6	8·6	8·2	5·6	5·2	4·4	2·6	
December	—	—	8	19	37	59	63	75	85	89	109	145	170	195	203	204	165	108	130	131	1
	—	—	0·3	0·8	1·5	2·4	2·6	3·1	3·5	3·7	4·5	6·0	7·0	8·0	8·3	8·4	6·8	4·4	5·3	5·4	
Regions F6. F7. G6. G7. H6. H7.																					
January	—	—	1	5	19	32	59	70	137	151	166	233	221	208	257	228	225	239	231	230	2
	—	—	0·0	0·1	0·5	0·8	1·5	1·7	3·4	3·8	4·1	5·8	5·5	5·2	6·4	5·7	5·6	6·0	5·8	5·7	
February	—	1	—	1	10	22	25	48	76	112	103	175	204	240	216	221	199	168	211	182	1
	—	0·0	—	0·0	0·3	0·7	0·8	1·5	2·3	3·4	3·2	5·3	6·2	7·3	6·6	6·8	6·1	5·1	6·4	5·6	
March	—	2	7	28	33	62	109	135	229	297	371	432	499	533	541	469	407	377	350	271	2
	—	0·0	0·1	0·5	0·6	1·0	1·8	2·3	3·8	5·0	6·2	7·3	8·4	9·0	9·1	7·9	6·8	6·3	5·9	4·6	
April	1	2	10	36	65	92	153	170	233	274	380	434	479	553	459	375	297	237	176	150	
	0·0	0·0	0·2	0·8	1·3	1·9	3·2	3·5	4·8	5·7	7·8	8·9	9·9	11·4	9·5	7·7	6·1	4·9	3·6	3·1	
May	1	2	7	14	47	55	97	116	139	130	171	200	258	278	259	228	220	175	151	121	1
	0·0	0·1	0·2	0·4	1·5	1·7	3·1	3·7	4·4	4·1	5·4	6·3	8·1	8·8	8·2	7·2	6·9	5·5	4·8	3·8	
June	—	—	—	—	1	—	2	6	9	2	7	16	16	21	14	28	23	18	13	10	
	—	—	—	—	0·5	—	0·9	2·8	4·3	0·9	3·3	7·6	7·6	10·0	6·6	13·3	10·9	8·5	6·2	4·7	
July	1	11	20	55	119	154	184	244	250	292	326	387	499	513	465	426	386	273	242	210	1
	0·0	0·2	0·4	1·0	2·1	2·7	3·3	4·3	4·4	5·2	5·8	6·9	8·9	9·1	8·3	7·6	6·9	4·9	4·3	3·7	
August	—	3	1	11	30	37	66	48	69	83	93	152	157	226	230	208	206	152	164	123	1
	—	0·1	0·0	0·4	1·2	1·5	2·6	1·9	2·8	3·3	3·7	6·1	6·3	9·0	9·2	8·3	8·2	6·1	6·5	4·9	
September	—	1	4	19	36	56	90	91	143	116	108	112	119	102	93	98	91	70	43	45	
	—	0·1	0·2	1·2	2·2	3·5	5·6	5·7	8·9	7·2	6·7	7·0	7·4	6·4	5·8	6·1	5·7	4·4	2·7	2·8	
October	—	—	1	4	23	35	70	90	90	93	105	88	120	129	107	123	83	66	61	63	
	—	—	0·1	0·3	1·6	2·4	4·8	6·2	6·2	6·4	7·2	6·1	8·3	8·9	7·4	8·5	5·7	4·6	4·2	4·4	
November	—	7	8	32	57	107	141	188	213	200	238	236	238	282	265	212	208	189	186	172	1
	—	0·2	0·2	0·8	1·4	2·7	3·6	4·8	5·4	5·1	6·0	6·0	6·0	7·2	6·7	5·4	5·3	4·8	4·7	4·4	
December	—	1	1	15	29	54	80	122	118	134	158	142	150	139	178	156	178	151	132	151	1
	—	0·0	0·0	0·4	0·8	1·5	2·3	3·4	3·3	3·8	4·4	4·0	4·2	3·9	5·0	4·4	5·0	4·2	3·7	4·2	

nth of 1946 for Statistical Rectangles G3, G4, H3, H4 and F6, F7, G6, G7, H6, H7.

47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	Total	1946 Regions G3. G4. H3. H4.
30	13	22	29	12	13	10	10	9	8	6	5	7	1	—	1	—	—	—	—	—		
0·5	0·2	0·3	0·5	0·2	0·2	0·2	0·2	0·1	0·1	0·1	0·1	0·1	0·0	—	0·0	—	—	—	—	—	6,419	January
13	14	14	15	9	11	7	2	2	1	2	—	1	—	1	—	—	1	—	—	—		
0·3	0·3	0·3	0·3	0·2	0·2	0·1	0·0	0·0	0·0	0·0	—	0·0	—	0·0	—	—	0·0	—	—	—	5,193	February
6	7	5	6	6	3	2	2	—	1	1	—	—	—	—	—	—	—	—	—	—		
0·1	0·1	0·1	0·1	0·1	0·1	0·0	0·0	—	0·0	0·0	—	—	—	—	—	—	—	—	—	—	5,239	March
3	3	4	—	2	1	1	—	1	—	—	1	—	—	—	—	—	—	—	—	—		
0·1	0·1	0·1	—	0·1	0·0	0·0	—	0·0	—	—	0·0	—	—	—	—	—	—	—	—	—	3,020	April
7	9	10	3	4	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—		
0·2	0·3	0·3	0·1	0·1	0·1	—	0·1	—	—	—	—	—	—	—	—	—	—	—	—	—	2,930	May
4	6	3	—	2	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—		
0·2	0·3	0·1	—	0·1	—	0·0	0·0	0·0	—	—	—	—	—	—	—	—	—	—	—	—	2,057	June
5	6	4	3	4	—	1	1	—	—	—	1	—	—	—	—	—	—	—	—	—		
0·2	0·2	0·1	0·1	0·1	—	0·0	0·0	—	—	—	0·0	—	—	—	—	—	—	—	—	—	2,969	July
5	4	4	3	1	—	—	1	—	—	—	2	—	—	—	—	—	—	—	—	—		
0·1	0·1	0·1	0·1	0·0	—	—	0·0	—	—	—	0·0	—	—	—	—	—	—	—	—	—	4,341	August
—	1	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
—	0·0	0·0	—	0·0	0·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2,653	September
4	2	3	1	2	1	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—		
0·1	0·1	0·1	0·0	0·1	0·0	—	0·0	—	—	—	—	—	—	0·0	—	—	—	—	—	—	4,430	October
4	1	1	4	1	—	3	—	1	1	—	—	—	—	—	—	—	—	—	—	—		
0·4	0·1	0·1	0·4	0·1	—	0·3	—	0·1	0·1	—	—	—	—	—	—	—	—	—	—	—	1,042	November
22	20	13	18	3	10	7	5	—	3	3	2	—	1	—	—	—	—	1	—	—		
0·9	0·8	0·5	0·8	0·1	0·4	0·3	0·2	—	0·1	0·1	0·1	—	0·0	—	—	—	—	0·0	—	—	2,435	December

76	53	51	62	54	20	37	24	23	5	10	6	6	4	3	—	—	—	—	—	—	Regions F6. F7. G6. G7. H6. H7.
1·9	1·3	1·3	1·6	1·4	0·5	0·9	0·6	0·6	0·1	0·3	0·2	0·2	0·1	0·1	—	—	—	—	—	—	4,001	January
34	48	39	48	34	34	29	19	12	11	14	9	6	3	1	1	1	—	—	—	—		
1·0	1·5	1·2	1·5	1·0	1·0	0·9	0·6	0·4	0·3	0·4	0·3	0·2	0·1	0·0	0·0	0·0	—	—	—	—	3,277	February
16	14	8	9	17	5	8	2	2	—	1	1	—	—	—	—	—	—	—	—	—		
0·3	0·2	0·1	0·2	0·3	0·1	0·1	0·0	0·0	—	0·0	0·0	—	—	—	—	—	—	—	—	—	5,952	March
9	4	6	2	3	3	—	—	1	—	—	1	1	—	—	—	—	—	—	—	—		
0·2	0·1	0·1	0·0	0·1	0·1	—	—	0·0	—	—	0·0	0·0	—	—	—	—	—	—	—	—	4,854	April
20	36	18	7	11	3	4	5	2	2	2	—	—	—	—	—	—	—	—	—	—		
0·6	1·1	0·6	0·2	0·3	0·1	0·1	0·2	0·1	0·1	0·1	—	—	—	—	—	—	—	—	—	—	3,169	May
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
0·5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	211	June
13	18	9	15	10	4	4	3	3	1	—	—	2	—	1	—	—	—	—	—	—		
0·2	0·3	0·2	0·3	0·2	0·1	0·1	0·0	0·0	0·0	—	—	0·0	—	0·0	—	—	—	—	—	—	5,623	July
17	19	13	6	9	4	6	4	1	3	—	—	—	2	2	—	—	—	—	—	—		
0·7	0·8	0·5	0·2	0·4	0·2	0·2	0·2	0·0	0·1	—	—	—	0·1	0·1	—	—	—	—	—	—	2,506	August
5	6	8	8	5	1	2	1	4	2	—	4	—	—	1	—	—	—	—	—	—		
0·3	0·4	0·5	0·5	0·3	0·1	0·1	0·1	0·2	0·1	—	0·2	—	—	0·1	—	—	—	—	—	—	1,602	September
1	—	2	1	3	2	1	—	2	—	1	—	—	—	—	—	—	—	—	—	—		
0·1	—	0·1	0·1	0·2	0·1	0·1	—	0·1	—	0·1	—	—	—	—	—	—	—	—	—	—	1,449	October
37	30	26	28	26	21	26	18	12	19	15	7	10	4	1	2	—	1	—	1	—		
0·9	0·8	0·7	0·7	0·7	0·5	0·7	0·5	0·3	0·5	0·4	0·2	0·2	0·1	0·0	0·0	—	0·0	—	0·0	—	3,938	November
74	83	81	73	73	78	68	51	64	32	31	29	13	11	6	4	3	2	—	—	—		
2·1	2·3	2·3	2·1	2·1	2·2	1·9	1·4	1·8	0·9	0·9	0·8	0·4	0·3	0·2	0·1	0·1	0·1	—	—	—	3,563	December

proportion of these had fallen away to increase again in the fourth quarter. There was also a successive increase in the proportion of smaller fish up to the third quarter, after which it decreased to a value slightly above that of the second quarter.

It is to be noted that the Rye Bay plaice of the first quarter were, on the average, much longer fish than those of any of the other samples. Compared with the previous year, the Rye plaice were about the same size in the first two quarters, but rather longer in the remainder of the year.

The length distribution for the two North Sea areas are given by the month in Figures 4 and 5. These show a recruitment of smaller fish beginning in July. The intake of these smaller fish appears to reach its maximum in September, but it is more extensive and more pronounced in the southernmost area.

Age Composition of Commercial Catche

Rye Bay (Table 3).

Otoliths were removed from four stones of t Rye Bay catch each month and the age determi tions produced therefrom have been summed quarterly and an annual percentage histogram Figures 6 and 7. The annual diagram shows th as in 1941 and 1945, the II group is domina though not quite so important as in the previo year. In addition there is a stronger I group th has appeared since the start of the work in R Bay. There is also a substantial III group. T older fish are relatively unimportant, but it m be noticed that the VI and VII groups (1940 a 1939 year-classes) remain stronger than the and V groups (1942 and 1941 year-classes).

In the seasonal series of histograms it is app ent that old and young age-groups are of nea

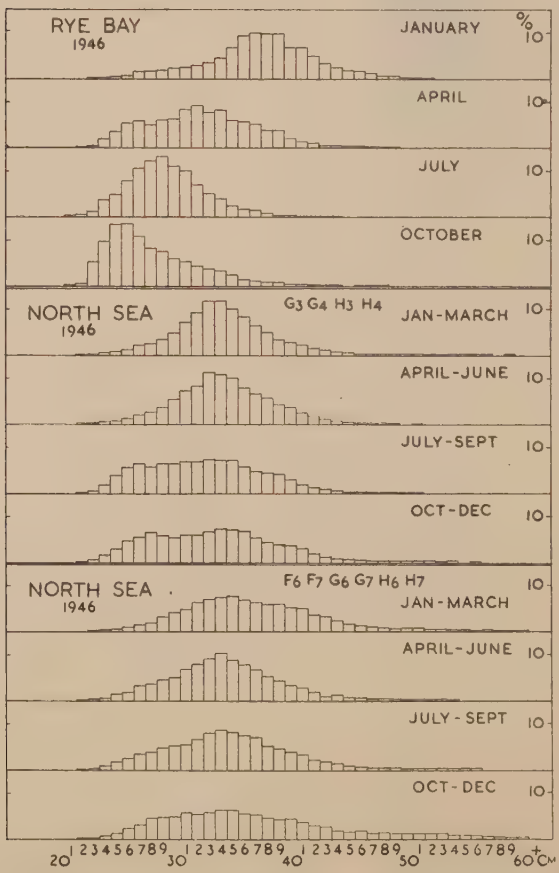


Fig. 3. Frequency Histograms showing the Length Distribution of Plaice from Rye Bay and from the two areas of the North Sea for each quarter of 1946.

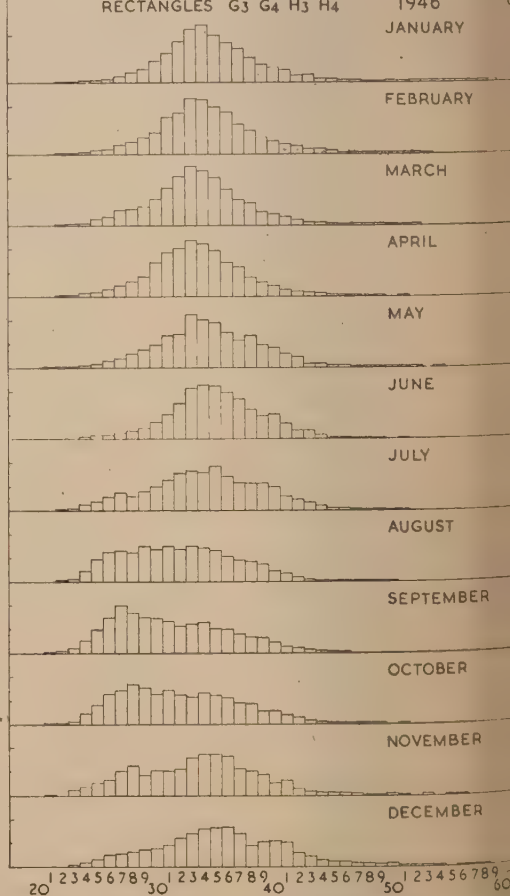


Fig. 4. Frequency Histograms showing the Length Dist ution of Plaice from Statistical Rectangles G3, G4, H3. each month during 1946.

ble 3. Rye Bay Plaice. Age-Composition of Commercial catches for each quarter and whole year 1946 by percentage, raised numbers, raised weight, and catch per 100 hours fishing.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	Total
. of fish examined	10	28	11	6	11	26	18	23	7	1	3	1	—	145
%	6·9	19·3	7·6	4·1	7·6	17·9	12·4	15·9	4·8	0·7	2·1	0·7	—	—
t. No. (in 1000's)														
fish landed	66	184	72	39	72	171	118	151	46	7	20	7	—	953
t. wt. (cwt)	206	719	363	215	427	1,360	1,049	1,823	452	96	225	94	—	7,029
tch per 100 hrs. (cwt)	0·8	2·9	1·5	0·9	1·7	5·4	4·2	7·3	1·8	0·4	0·9	0·4	—	28·2
. of fish examined	—	25	40	16	20	19	29	10	14	4	—	1	—	178
%	—	14·0	22·5	9·0	11·2	10·7	16·3	5·6	7·9	2·2	—	0·6	—	—
t. No. (in 1000's)														
fish landed	—	116	185	74	92	88	134	46	65	18	—	5	—	823
t. wt. (cwt)	—	490	972	425	546	568	970	446	546	147	—	72	—	5,182
tch per 100 hrs. (cwt)	—	1·8	3·5	1·5	2·0	2·0	3·5	1·6	2·0	0·5	—	0·3	—	18·7
. of fish examined	38	142	63	13	3	3	2	3	2	—	—	—	1	270
%	14·1	52·6	23·4	4·8	1·1	1·1	0·7	1·1	0·7	—	—	—	0·4	—
t. No. (in 1000's)														
fish landed	32	120	53	11	3	3	2	3	2	—	—	—	0·8	229
t. wt. (cwt)	89	585	292	71	16	24	12	22	15	—	—	—	12	1,138
tch per 100 hrs. (cwt)	1·1	6·9	3·5	0·8	0·2	0·3	0·1	0·3	0·2	—	—	—	0·1	13·5
. of fish examined	87	88	42	3	5	1	5	2	3	—	—	—	—	236
%	36·9	37·3	17·8	1·3	2·1	0·4	2·1	0·8	1·3	—	—	—	—	—
t. No. (in 1000's)														
fish landed	66	67	32	2	4	0·8	4	2	2	—	—	—	—	179
t. wt. (cwt)	241	361	206	22	25	6	44	20	27	—	—	—	—	952
tch per 100 hrs. (cwt)	4·3	6·4	3·6	0·4	0·4	0·1	0·8	0·4	0·5	—	—	—	—	16·9
. of fish examined	135	283	156	38	39	49	54	38	26	5	3	2	1	829
%	16·3	34·1	18·8	4·6	4·7	5·9	6·5	4·6	3·2	0·6	0·4	0·2	0·1	—
t. No. (in 1000's)														
fish landed	164	487	342	127	171	262	258	201	115	25	20	11	0·8	2,184
t. wt. (cwt)	536	2,155	1,833	733	1,014	1,958	2,075	2,311	1,040	243	225	166	12	14,301
tch per 100 hrs. (cwt)	0·8	3·2	2·7	1·1	1·5	2·9	3·1	3·5	1·6	0·4	0·3	0·2	0·0	21·3

l importance for the first two quarters. In the ner quarter the II group is of paramount im- nce and this and the I and III groups account irtually the whole population in the last two ers. Considering the last quarter alone it is that the I and II groups are dominant.

omparing the older fish found in the first and d quarters, it should be noted that, as the day of the plaice has been taken as April 1st, VI group of the first quarter becomes the VII of the second. These groups dominate the part of the population and are identical with uccessful 1939 year-class whose strength has dy been mentioned in Vol. II of the *Annales giques*, and which has also been noted for the -eastern North Sea by Bückmann (1). It ins to add that the decreasing age of the lation as the season progresses corresponds to ecrease in size shown by the length measure- given in Figure 3 and Table 1.

Rectangles G3, G4, H3 and H4. (Table 4).

Samples for the age determination of plaice taken from Lowestoft and Grimsby markets each month have been divided into two lots in the same way as the length measurements. It is to be noted that, although the numbers were greater than those of Rye Bay, they came from a much more extensive area.

The percentage age distribution is shown by quarters in Figure 8. It is clear that the population landed from the statistical rectangles in the neighbourhood of Lowestoft was substantially older than that caught in Rye Bay. It is interesting to note that the VII group is dominant in the second and fourth quarters and the VI in the first. These age-groups represent the 1939 year-class whose strength was so notable a feature of the Rye Bay population. On either side of these age-groups the others fall away in importance, except in the third quarter, when the III, IV and V groups appear in considerable strength.

Table 4. Plaice from Statistical Rectangles G3, G4, H3, H4 — Age Composition of Commercial Catches for each quarter and whole year 1946 by percentage, raised numbers, raised weight and catch per 100 hours fishing.

1946		II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV+	Total
Jan.—March	No. of fish examined	10	14	79	137	301	261	102	64	43	22	7	4	1	1,045
	%	1·0	1·3	7·6	13·1	28·8	25·0	9·8	6·1	4·1	2·1	0·7	0·3	0·1	—
	Est. No. (in 1000's) of fish landed	57	79	447	775	1,702	1,476	577	362	243	124	40	23	6	5,909
	Est. wt. (cwt)	195	284	1,990	4,778	12,019	11,943	5,095	3,270	2,534	1,380	346	216	85	44,135
	Catch per 100 hrs. (cwt)	0·5	0·7	5·2	12·5	31·5	31·3	13·3	8·6	6·6	3·6	0·9	0·6	0·2	115·5
April—June	No. of fish examined	—	6	22	92	141	183	129	73	51	37	12	9	3	758
	%	—	0·8	2·9	12·1	18·6	24·2	17·0	9·6	6·7	4·9	1·6	1·2	0·4	—
	Est. No. (in 1000's) of fish landed	—	36	132	551	844	1,095	772	437	305	221	72	54	18	4,537
	Est. wt. (cwt)	—	167	585	2,802	5,009	7,350	6,476	4,018	2,900	2,348	848	617	213	33,333
	Catch per 100 hrs. (cwt)	—	0·4	1·5	7·4	13·2	19·4	17·1	10·6	7·6	6·2	2·2	1·6	0·6	87·8
July—Sept.	No. of fish examined	8	154	127	150	114	150	134	61	48	30	16	11	5	1,008
	%	0·8	15·3	12·6	14·9	11·3	14·9	13·3	6·0	4·7	3·0	1·6	1·1	0·5	—
	Est. No. (in 1000's) of fish landed	31	603	497	588	447	588	525	239	188	118	63	43	20	3,948
	Est. wt. (cwt)	108	2,240	2,153	2,967	2,585	4,300	4,693	2,217	1,787	1,154	607	515	236	25,562
	Catch per 100 hrs. (cwt)	0·3	6·2	6·0	8·2	7·2	11·9	13·0	6·1	4·9	3·2	1·7	1·4	0·7	70·8
Oct.—Dec.	No. of fish examined	—	3	4	12	22	40	37	24	12	15	2	1	2	174
	%	—	1·7	2·3	6·9	12·6	23·0	21·3	13·8	6·9	8·6	1·1	0·6	1·2	—
	Est. No. (in 1000's) of fish landed	—	22	29	86	158	287	266	172	86	108	14	7	14	1,249
	Est. wt. (cwt)	—	93	137	622	1,195	2,601	2,728	2,050	1,238	1,573	204	92	227	12,760
	Catch per 100 hrs. (cwt)	—	0·4	0·6	2·5	4·8	10·5	11·0	8·2	5·0	6·3	0·8	0·4	1·0	51·5
Whole Year	No. of fish examined	18	177	232	391	578	634	402	222	154	104	37	25	11	2,985
	%	0·6	5·9	7·8	13·1	19·4	21·3	13·5	7·4	5·2	3·5	1·2	0·8	0·3	—
	Est. No. (in 1000's) of fish landed	88	740	1,105	1,999	3,150	3,446	2,139	1,210	823	571	188	127	58	15,643
	Est. wt. (cwt)	303	2,784	4,865	11,169	20,808	26,194	18,992	11,555	8,459	6,455	2,005	1,440	761	115,790
	Catch per 100 hrs. (cwt)	0·2	2·0	3·5	8·1	15·2	19·1	13·8	8·4	6·2	4·7	1·5	1·0	0·5	84·2

Table 5. Plaice from Statistical Rectangles F6, F7, G6, G7, H6, H7 — Age Composition of Commercial Catches for each quarter and whole year 1946 by percentage, raised numbers, raised weight and catch per 100 hours fishing.

1946		II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV+	Total
Jan.—March	No. of fish examined	3	13	41	76	171	146	79	58	27	14	4	4	2	638
	%	0·5	2·1	6·4	11·9	26·8	22·9	12·4	9·1	4·2	2·2	0·6	0·6	0·3	—
	Est. No. (in 1000's) of fish landed	28	123	387	718	1,616	1,380	747	548	255	132	38	38	19	6,030
	Est. wt. (cwt)	134	536	2,163	5,157	14,787	15,383	9,077	8,138	4,300	2,460	787	461	431	63,814
	Catch per 100 hrs. (cwt)	0·3	1·0	4·2	9·9	28·5	29·6	17·5	15·7	8·3	4·7	1·5	0·9	0·8	122·9
April—June	No. of fish examined	1	10	29	75	129	180	113	77	36	30	18	9	5	712
	%	0·1	1·4	4·1	10·5	18·1	25·3	15·9	10·8	5·1	4·2	2·5	1·3	0·7	—
	Est. No. (in 1000's) of fish landed	8	78	225	583	1,002	1,398	878	598	280	233	140	70	39	5,530
	Est. wt. (cwt)	35	305	1,128	2,946	6,225	10,175	7,919	5,776	2,689	2,808	1,924	953	550	43,433
	Catch per 100 hrs. (cwt)	0·1	0·7	2·5	6·6	14·0	22·8	17·8	13·0	6·0	6·3	4·3	2·1	1·3	97·5
July—Sept.	No. of fish examined	—	37	145	96	86	123	83	37	25	18	5	3	2	660
	%	—	5·6	22·0	14·5	13·0	18·6	12·6	5·6	3·8	2·7	0·8	0·4	0·4	—
	Est. No. (in 1000's) of fish landed	—	236	925	612	548	784	529	236	159	115	32	19	13	4,208
	Est. wt. (cwt)	—	939	4,012	3,732	4,046	7,565	5,727	2,521	2,198	1,719	380	379	275	33,493
	Catch per 100 hrs. (cwt)	—	2·1	8·8	8·2	8·8	16·5	12·5	5·5	4·8	3·8	0·8	0·8	0·6	73·2
Oct.—Dec.	No. of fish examined	7	54	90	78	86	102	62	43	33	19	12	14	4	604
	%	1·2	8·9	14·9	12·9	14·2	16·9	10·3	7·1	5·5	3·1	2·0	2·3	0·7	—
	Est. No. (in 1000's) of fish landed	37	288	480	416	459	544	331	229	176	101	64	75	21	3,222
	Est. wt. (cwt)	133	1,207	2,388	2,368	3,494	4,775	3,277	2,284	2,105	1,613	1,022	1,376	533	26,575
	Catch per 100 hrs. (cwt)	0·3	2·6	5·1	5·1	7·5	10·2	7·0	4·9	4·5	3·5	2·2	2·9	1·2	57·0
Whole Year	No. of fish examined	11	114	305	325	472	551	337	215	121	81	39	30	13	2,614
	%	0·4	4·4	11·7	12·4	18·1	21·1	12·9	8·2	4·6	3·1	1·5	1·1	0·5	—
	Est. No. (in 1000's) of fish landed	73	725	2,017	2,329	3,625	4,106	2,484	1,612	870	581	274	202	92	18,990
	Est. wt. (cwt)	302	2,987	9,691	14,203	28,552	37,898	26,000	18,719	11,292	8,600	4,113	3,169	1,789	167,315
	Catch per 100 hrs. (cwt)	0·2	1·6	5·1	7·5	15·1	20·1	13·8	9·9	6·0	4·6	2·2	1·7	0·9	88·7

Table 6. Plaice from Commercial Landings at Lowestoft and Grimsby. Age Composition for each quarter and whole year 1946 by percentage, raised numbers, raised weight and catch per 100 hours fishing.

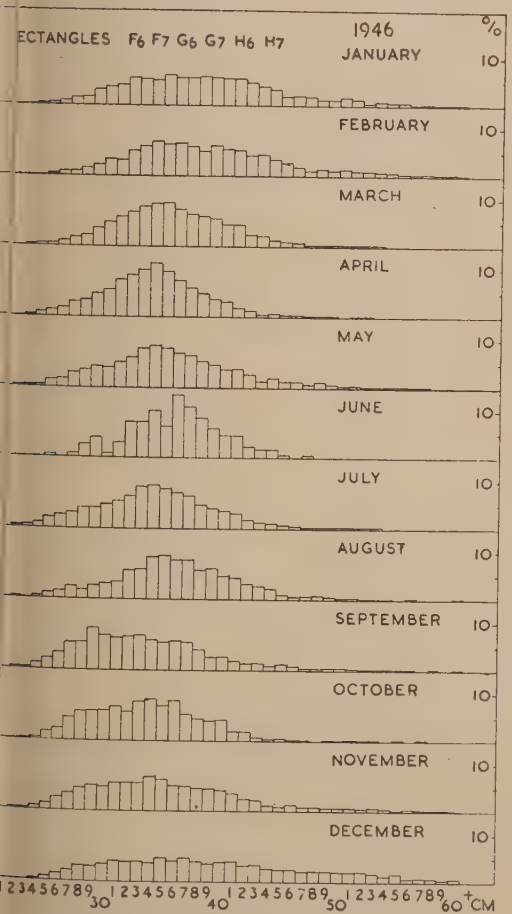
1946		II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV+	Total
Jan.—March	No. of fish examined	17	43	172	296	614	521	242	151	92	46	15	11	6	2,226
	%	0·8	1·9	7·7	13·3	27·6	23·4	10·9	6·8	4·1	2·1	0·7	0·5	0·2	—
	Est. No. (in 1000's) of fish landed	122	325	1,222	2,087	4,306	3,733	1,761	1,091	652	323	111	87	47	15,866
	Est. wt. (cwt)	436	1,349	5,808	13,157	33,157	35,513	18,540	13,411	8,809	4,600	1,629	1,501	1,074	139,434
	Catch per 100 hrs. (cwt)	0·4	1·2	5·1	11·6	29·6	31·3	16·3	11·8	7·8	4·1	1·4	1·3	0·9	122·8
April—June	No. of fish examined	1	22	85	254	415	580	394	238	134	90	41	23	13	2,290
	%	0·1	1·0	3·7	11·1	18·1	25·3	17·2	10·4	5·9	3·9	1·8	1·0	0·5	—
	Est. No. (in 1000's) of fish landed	8	154	635	1,810	3,083	4,303	2,953	1,821	1,013	657	327	171	109	17,045
	Est. wt. (cwt)	37	627	3,136	9,914	19,284	31,428	26,372	16,313	10,115	7,665	4,456	2,348	1,665	133,360
	Catch per 100 hrs. (cwt)	0·0	0·5	2·3	7·3	14·2	23·2	19·5	12·0	7·5	5·7	3·3	1·7	1·2	98·4
July—Sept.	No. of fish examined	8	234	342	340	284	414	318	157	110	74	34	20	11	2,346
	%	0·3	10·0	14·6	14·5	12·1	17·6	13·6	6·7	4·7	3·2	1·4	0·8	0·5	—
	Est. No. (in 1000's) of fish landed	25	1,315	2,134	2,265	1,937	2,795	1,991	1,020	644	498	209	112	59	15,005
	Est. wt. (cwt)	85	5,514	9,138	14,191	14,829	25,795	19,598	11,789	7,714	7,214	2,442	1,683	1,102	121,094
	Catch per 100 hrs. (cwt)	0·1	3·5	5·8	9·0	9·4	16·4	12·5	7·5	4·9	4·6	1·6	1·1	0·7	77·1
Oct.—Dec.	No. of fish examined	29	253	256	264	201	283	200	129	83	61	27	20	12	1,818
	%	1·6	13·9	14·1	14·5	11·1	15·6	11·0	7·1	4·6	3·4	1·5	1·1	0·5	—
	Est. No. (in 1000's) of fish landed	82	774	1,010	926	836	1,230	836	551	340	259	121	89	62	7,118
	Est. wt. (cwt)	288	3,134	5,069	5,392	6,535	11,698	9,385	7,060	4,605	4,344	2,270	1,836	2,048	63,664
	Catch per 100 hrs. (cwt)	0·3	2·8	4·5	4·7	5·7	10·3	8·2	6·2	4·0	3·8	2·0	1·6	1·7	55·8
Whole Year	No. of fish examined	55	552	855	1,154	1,514	1,798	1,154	675	419	271	117	74	42	8,680
	%	0·6	6·4	9·9	13·3	17·4	20·7	13·3	7·8	4·8	3·1	1·3	0·9	0·5	—
	Est. No. (in 1000's) of fish landed	237	2,569	5,002	7,088	10,163	12,061	7,541	4,484	2,650	1,737	767	459	276	55,033
	Est. wt. (cwt)	846	10,624	23,151	42,654	74,255	104,434	73,895	48,573	31,243	23,823	10,797	7,368	5,889	457,552
	Catch per 100 hrs. (cwt)	0·2	2·0	4·5	8·2	14·3	20·1	14·2	9·3	6·0	4·6	2·1	1·4	1·1	88·0

Table 7. Age Distribution of Rye Bay Plaice in 1946 with respect to average length, average weight, standard deviation of lengths, and relation between length and weight.

	II	III	IV	V	VI	VII	VIII
Av. Length (cm.)	28·4	30·1	31·7	31·9	34·9	35·7	46·8
Av. Weight (g.)	248	287	318	307	381	415	569
S.D.	3·25	3·42	3·28	2·61	3·37	3·45	4·12
C.I.	0·00798 $L^{3.075}$	0·00899 $L^{3.033}$	0·00231 $L^{3.401}$	0·00472 $L^{3.188}$	0·0221 $L^{2.742}$	0·0143 $L^{2.867}$	0·0153 $L^{2.844}$

Rectangles F6, F7, G6, G7, H6, H7. (Table 5).

The age distribution of plaice taken from the northern rectangles is shown in Figure 9 as quarterly percentages. The seasonal distribution by age resembles that of the area to the south in showing the strength of the 1939 year-class. The other year-classes are similarly distributed to those further out in the first two quarters, but the recruitment of II, IV and V groups which appear only in the third quarter in the fish from the southern area is also evident in the fourth quarter in the more northern rectangles.



5. Frequency Histograms showing the Length Distribution of Plaice from Statistical Rectangles F6, F7, G6, G7, H6, H7, each month during 1946.

Average Length of Age-Groups.

(Tables 7, 8 and 9).

A comparison of the figures for the mean lengths of age-groups in the different areas shows that all the age-groups available from the Rye area up to group VII had an average length greater than their contemporaries in the North Sea (Figure 10). Of the two North Sea areas, fish were longer at all age-groups in the north. The Rye Bay fish had greater average lengths for the I and II-group fish than was the case in 1945, but the remaining age-groups of any consequence were made up of smaller fish in 1946.

Average Weight of Age-Groups.

(Tables 7, 8, 9 and 10).

The average weights of the different age-groups resemble the lengths in that they show the Rye Bay plaice to be heavier than those from the North Sea up to the V group. Similarly the fish from the more northerly group of rectangles in the North Sea are superior in weight to those of the southern

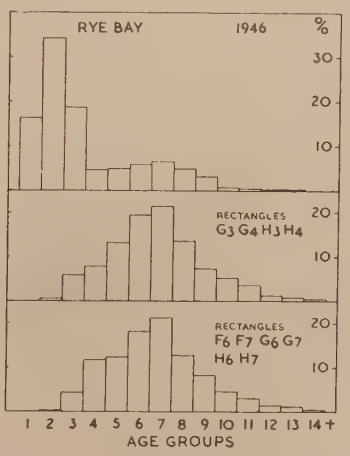


Fig. 6. Percentage Age-Distribution of Plaice from Rye Bay and two areas of the North Sea in 1946.

Table 8. Plaice from Statistical Rectangles G3, G4, H3, H4. Age Distribution by quart deviation of lengths and

1946		II	III	IV	V	VI	V
Jan.—March	Aver. Length (cm.)	26·5	27·5	29·3	32·5	34·1	3
	Aver. Weight (g.)	176	182	226	313	359	41
	S (l)	2·31	2·57	2·55	2·85	2·79	
	Cl^n	0·001424 L$^{3·5990}$	0·006662 L$^{3·0745}$	0·006189 L$^{3·1021}$	0·01521 L$^{2·8480}$	0·006826 L$^{3·0735}$	0·0105
April—June	Aver. Length (cm.)	—	28·8	29·0	30·3	32·3	3
	Aver. Weight (g.)	—	237	226	258	302	34
	S (l)	—	3·39	2·89	2·84	2·87	
	Cl^n	—	—	0·02986 L$^{2·6431}$	0·022 L$^{2·7436}$	0·02348 L$^{2·7193}$	0·0103
July—Sept.	Aver. Length (cm.)	26·1	26·9	28·4	30·1	32·0	3
	Aver. Weight (g.)	175	189	220	257	294	37
	S (l)	2·50	2·02	2·25	2·59	2·25	
	Cl^n	—	0·03251 L$^{2·6327}$	0·01582 L$^{2·8423}$	0·02002 L$^{2·7709}$	0·04541 L$^{2·5264}$	0·0936
Oct.—Dec.	Aver. Length (cm.)	—	28·5	30·5	33·8	35·0	3
	Aver. Weight (g.)	—	218	242	367	385	46
	S (l)	—	2·65	1·15	3·14	2·50	
	Cl^n	—	—	—	0·002604 L$^{3·3625}$	0·003445 L$^{3·2675}$	0·00712
1946	Aver. Length (cm.)	26·3	27·0	28·8	31·1	33·3	3
	Aver. Weight (g.)	175	190	223	280	333	38
	S (l)	2·33	2·15	2·44	3·00	2·88	
	Cl^n	0·005505 L$^{3·1696}$	0·02552 L$^{2·7055}$	0·01292 L$^{2·8947}$	0·01406 L$^{2·8768}$	0·01307 L$^{2·8929}$	0·0172

Table 9. Plaice from Statistical Rectangles F6, F7, G6, G7, H6, H7. Age Distribution by standard deviation of lengths and

1946		II	III	IV	V	VI	V
Jan.—March	Aver. Length (cm.)	29·5	28·7	31·2	33·8	36·5	
	Aver. Weight (g.)	240	222	284	365	465	5
	S (l)	4·00	4·13	3·91	4·17	4·57	
	Cl^n	—	0·003166 L$^{3·2969}$	0·003786 L$^{3·2440}$	0·003382 L$^{3·2735}$	0·003158 L$^{3·2936}$	0·00
April—June	Aver. Length (cm.)	31·5	27·4	29·7	30·0	32·6	
	Aver. Weight (g.)	230	200	254	257	316	3
	S (l)	—	2·85	2·79	3·28	2·32	
	Cl^n	—	0·04002 L$^{2·5682}$	0·007504 L$^{3·0664}$	0·03061 L$^{2·6486}$	0·05672 L$^{2·4698}$	0·031
July—Sept.	Aver. Length (cm.)	—	27·9	28·7	31·8	34·0	
	Aver. Weight (g.)	—	202	220	310	375	4
	S (l)	—	2·67	2·31	3·29	3·23	
	Cl^n	—	0·01487 L$^{2·8562}$	0·003882 L$^{3·2602}$	0·002505 L$^{3·3829}$	0·005232 L$^{3·1634}$	0·0013
Oct.—Dec.	Aver. Length (cm.)	26·2	28·5	29·9	31·3	34·4	
	Aver. Weight (g.)	181	213	253	289	387	
	S (l)	2·50	2·36	2·53	2·91	3·57	
	Cl^n	0·002202 L$^{3·4501}$	0·009747 L$^{2·9753}$	0·008294 L$^{3·0247}$	0·008009 L$^{3·0413}$	0·008596 L$^{3·0195}$	0·001
1946	Aver. Length (cm.)	27·6	28·2	29·5	31·7	34·6	
	Aver. Weight (g.)	202	209	242	305	393	
	S (l)	3·30	2·74	2·81	3·66	3·96	
	Cl^n	0·01062 L$^{2·9552}$	0·01491 L$^{2·8580}$	0·007896 L$^{3·0438}$	0·0088 L$^{3·0176}$	0·005829 L$^{3·1318}$	0·00

the whole year 1946 with respect to average length, average weight, standard veen length and weight.

VIII	IX	X	XI	XII	XIII	XIV
37·0	37·3	39·2	40·5	38·5	40·5	43·5
449	459	529	564	444	485	760
3·73	3·59	4·52	4·08	2·08	2·58	—
)91 $L^{3.02}$	0·009616 $L^{2.9686}$	0·002566 $L^{3.3209}$	0·01090 $L^{2.9229}$	—	—	—
36·6	38·1	38·6	40·0	41·2	40·8	41·8
426	467	483	539	600	582	603
3·08	2·83	3·66	4·50	6·41	4·00	6·43
130 $L^{2.8825}$	0·02596 $L^{2.6803}$	0·0143 $L^{2.8427}$	0·02094 $L^{2.7419}$	—	—	—
36·8	37·6	37·7	38·5	39·6	41·5	40·5
454	471	483	499	492	607	600
2·88	2·85	2·99	3·32	3·20	4·38	—
805 $L^{3.0333}$	0·02912 $L^{2.6702}$	0·01633 $L^{2.8331}$	0·02309 $L^{2.7294}$	—	—	—
38·0	39·0	41·9	41·6	42·0	42·5	43·5
522	605	730	742	722	650	630
3·79	4·72	5·04	6·13	0·22	—	—
274 $L^{3.3805}$	0·001664 $L^{3.4780}$	0·001014 $L^{3.5912}$	0·0002939 $L^{3.9202}$	—	—	—
36·9	37·8	38·8	39·9	40·1	41·1	41·7
450	481	515	562	530	580	625
3·27	3·33	3·97	4·45	4·34	3·80	—
09 $L^{3.0586}$	0·004231 $L^{3.1995}$	0·002363 $L^{3.3542}$	0·002962 $L^{3.2813}$	0·01993 $L^{2.7578}$	0·005436 $L^{3.1043}$	—

for the whole year 1946 with respect to average length, average weight. veen length and weight.

VIII	IX	X	XI	XII	XIII	XIV
40·1	42·5	44·9	44·9	45·8	43·2	50·7
618	754	856	945	1058	620	1158
4·55	5·82	5·94	7·33	4·99	—	—
881 $L^{3.6619}$	0·002354 $L^{3.3609}$	0·002208 $L^{3.3628}$	0·001225 $L^{3.5335}$	—	—	—
37·2	38·2	38·7	40·8	43·2	43·4	41·8
458	491	489	612	699	693	640
3·18	3·50	4·07	5·01	4·65	4·91	—
006 $L^{2.6582}$	0·04294 $L^{2.5628}$	0·05595 $L^{2.4733}$	0·01517 $L^{2.8333}$	—	—	—
39·0	38·8	42·3	43·1	41·7	48·2	40·5
550	543	700	761	605	1007	570
3·35	3·90	3·30	5·45	3·42	5·85	—
102 $L^{3.2149}$	0·0112 $L^{2.9464}$	0·003029 $L^{3.2939}$	0·001434 $L^{3.4880}$	—	—	—
37·7	38·2	40·0	42·6	43·4	44·6	49·5
503	506	607	808	811	936	1145
2·79	3·33	4·50	6·08	4·81	6·80	—
478 $L^{3.5023}$	0·009590 $L^{2.9869}$	0·0014 $L^{3.5075}$	0·0004024 $L^{3.8388}$	—	—	—
38·4	39·5	41·2	42·5	43·3	44·4	45·6
526	574	647	749	758	828	887
3·70	4·65	5·06	5·88	4·54	5·74	—
39 $L^{3.3627}$	0·007496 $L^{3.0584}$	0·003332 $L^{3.2626}$	0·0008991 $L^{3.6144}$	0·00197 $L^{3.4042}$	0·001576 $L^{3.4560}$	—

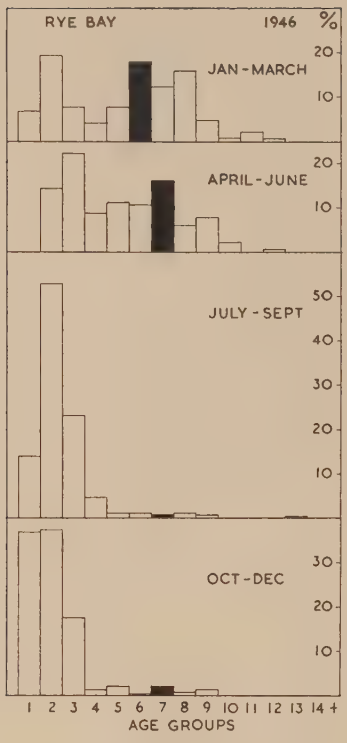


Fig. 7.

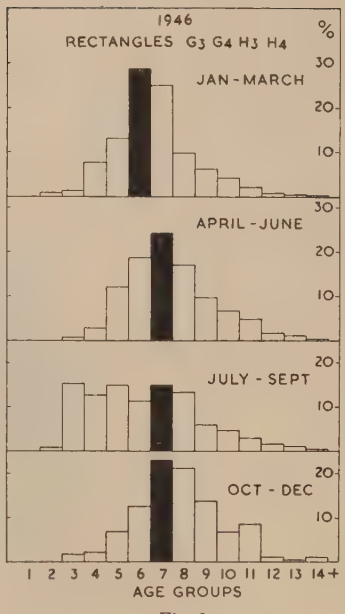


Fig. 8.

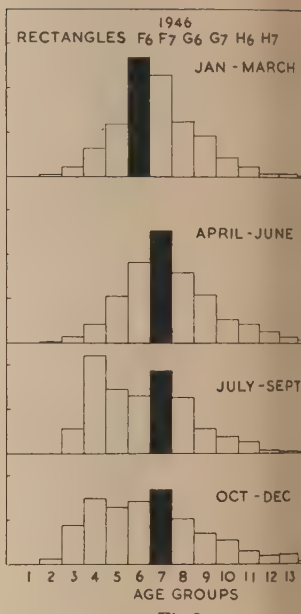


Fig.9.

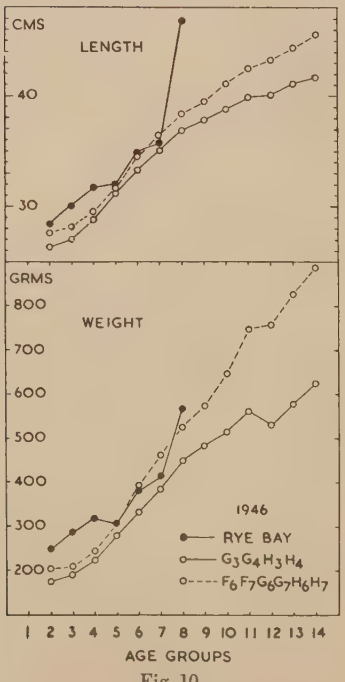


Fig. 10.

Fig. 7. Percentage Age-Distribution of Plaice by quarters for Rye Bay. The 1 birth-group is shown in black.

Fig. 8. Percentage Age-Distribution of Plaice by quarters for North Sea Sta ical Rectangles G3, G4, H3, H4. The 1939 birth-group is shown in black.

Fig. 9. Percentage Age-Distribution of Plaice by quarters for North Sea Sta ical Rectangles F6, F7, G6, G7, H6, H7. The 1939 birth-group is shown in bl

Fig. 10. Mean Lengths and Weights for year-groups in respect of Plaice f Rye Bay Statistical Rectangles G3, G4, H3, H4, and F6, F7, G6, G7, H6, H7.

Table 10. Rye Bay Plaice. Average Weight (in grams) of each age-group for each year 1942—1946.

Age-Group	I	II	III	IV	V
1942					
No.	5	72	164	144	89
Av. Wt. (g)	81·6	194·3	221·5	215·1	299·6
1943					
No.	17	103	101	147	93
Av. Wt. (g)	86·2	176·9	236·6	255·7	327·5
1944					
No.	5	88	41	68	111
Av. Wt. (g)	76·0	216·6	286·5	313·9	343·5
1945					
No.	88	292	103	34	47
Av. Wt. (g)	72·7	143·0	285·3	309·3	341·8
1946					
No.	136	283	156	38	39
Av. Wt. (g)	171·7	248·1	287·1	317·6	306·7

Table 11. Number of Fishing Trips made by motor trawlers working from Rye Bay Fishing Stations. (Hastings, Rye, Dungeness).

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1945	190	710	1250	1205	831	883	769	533	535	548	492	182
1946	345	720	992	1198	711	550	555	362	342	468	159	115

ıp at all age-groups. In view of the fact that female plaice is generally heavier and longer the male of the same age these differences quite well be due to differences in the pro- ions of the sexes from the three areas where percentages of males were as follows:

Rye Bay.	45·3
G 3, G 4, H 3, H 4.	59·7
F 6, F 7, G 6, G 7, H 6, H 7.	50·5

Considering the Rye Bay results for 1946 ngside those of 1945, we see that except for the roup which fell, the remaining groups available comparison showed an increase in weight which specially marked in the case of the I and II ups. Although taken together the I and II ups had much the same numerical proportion he other groups as they had in 1945. I think r greater weight in 1946 may have been due decrease in the population density in that year. average weights of the age-groups I—V for Bay from 1942 to 1946 are given in Figure 11, nce it is apparent that there has been a tendency these average weights to increase through this od.

Intensity of Fishing.

(Tables 3, 4, 5, 6, 11 and 12).

Taking a mean for the year from the figures lst class trawlers given at the beginning of this er, and allowing a crew of 10 for Grimsby and r Lowestoft boats, the estimated average number nen engaged in the trawl fishery from Grimsby Lowestoft in 1946 was 2,130. It will be seen n Table 6 that these men caught 55,033,000 ce, weighing 457,550 cwts., and giving a catch 100 hours fishing of 88 cwts. This means that fisherman was responsible for landing ap- ximately 210 cwts. of plaice.

Inshore fishing vessels at work from the Rye Bay stations of Hastings, Rye and Dungeness differed from the North Sea trawlers in the fact that their numbers were diminishing. In 1945 it is estimated from petrol claim forms that 73 boats were working regularly, but for 1946 this number must be reduced to 68. Although many of these craft carried only two men a substantial proportion had three, so that a reasonable compromise may be made if we put the number of the crew at 2·5. In these circumstances the Rye Bay catch of 2,184,000 plaice, weighing 14,300 cwts. at a rate of 21·3 cwts. per 100 hours fishing may be attributed to 170 men. A working fisherman in Rye Bay would therefore have landed approximately 80 cwts. of plaice.

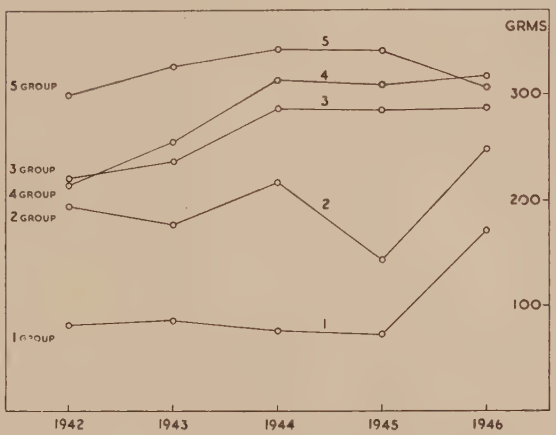


Fig. 11. Average Weight in grams for Rye Bay Plaice of age-groups I—V for the years 1942—1946.

Although these figures show the Rye Bay catch to have been both absolutely and relatively inferior to that from the North Sea when the whole plaice

ble 12. Catch per Hours Absence from Port in stones and pounds for trawlers of Rye Bay Fishing Stations.

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Mean
1—13½	4—5¼	3—6¼	2—11¾	3—7¼	2—10¾	1—13¾	1—6½	1—8½	1—4¼	1—2½	1—1½	2—6
1—6¼	4—11¾	3—12½	4—3½	4—8¼	2—11¾	1—13¼	1—5½	1—3¼	1—2	1—1¾	1—2¼	2—13½
0—10	4—12½	3—5¾	4—0¾	3—9	2—11	1—8	0—9½	0—11¼	0—13	0—12¾	3—5	2—12¾
2—5	2—5¼	1—11	1—4	1—13¼	1—5¼	1—3	1—3¾	1—9	1—8½	1—6¼	1—7¼	1—9¾
2—4½	2—4¼	1—12	1—8½	2—1¾	1—6¾	1—1¼	1—2¾	1—0¾	1—0½	0—13	0—13½	1—12½
1—8½	1—11½	1—9	1—2	1—5	0—12	0—9	0—11¾	0—8¼	0—7¾	0—7	—	1—1½

Table 13. Landings of Plaice at Hastings in cwt., (percentage in brackets) and below (a) Plaice, (b) all Demersal Fish, at Rye Bay Ports.

	1945			1946		
	Large %	Medium %	Small %	Large %	Medium %	Small %
January	41 (15)	160 (60)	66 (25)	109 (15)	449 (60)	184 (25)
February	230 (15)	913 (58)	426 (27)	159 (14)	666 (59)	297 (27)
March	320 (13)	1425 (59)	684 (28)	112 (12)	550 (61)	241 (27)
April	158 (13)	694 (58)	348 (29)	73 (12)	354 (60)	167 (28)
May	166 (13)	740 (58)	364 (29)	86 (13)	401 (59)	195 (28)
June	127 (13)	588 (58)	293 (29)	28 (12)	140 (59)	68 (29)
July	35 (12)	166 (57)	89 (31)	15 (12)	70 (58)	36 (30)
August	20 (13)	87 (57)	46 (30)	20 (12)	94 (58)	49 (30)
September	20 (13)	88 (58)	44 (29)	13 (12)	64 (58)	34 (30)
October	26 (13)	117 (58)	59 (29)	46 (12)	226 (58)	117 (30)
November	26 (14)	106 (57)	54 (29)	17 (11)	95 (60)	47 (29)
December	9 (13)	42 (59)	20 (28)	14 (13)	66 (59)	31 (28)
Total	1178 (13·4)	5126 (58·3)	2493 (28·3)	692 (13·0)	3175 (59·5)	1466 (27·5)
		8,797			5,333	
(a)		24,650			14,301	
(b)		31,065			17,867	

population is considered, this is not so for all parts of that population. The unusual abundance of I and II groups in the Rye Bay area (Table 7) has meant that over three times the weight and well on to three times as many by numbers of the plaice of II group and under were landed from this area compared with the North Sea.

The catch per 100 hours fishing (absence from port for Rye area) was much less in Rye Bay than in the North Sea in 1946 and the number of fishing trips made by Rye Bay motor trawlers shows that this has diminished sharply since the figures published for 1941 to 1944 in Vol. II of the *Annales Biologiques* (Table 11). The reason for this deterioration is apparent on consulting Table 12 which shows the catch per hours absence for certain Rye Bay fishing stations, particularly Dungeness, where the fishing fleet continued to retain the identity it had during the war. It is apparent that the fall in the catch per hours absence has been quite steep. Finally, it has to be pointed out in considering the intensity of fishing in Rye Bay that after 1944 the fishing trips were not limited to daylight, but were allowed to take place by day and night.

Commercial Landings.

(Tables 6. 7 and 13).

The landings of plaice at Grimsby and Lowestoft are indicated in Table 6 and the way the catch per boat declined from the very high values found when fishing was resumed in 1945 is being dealt with elsewhere by a colleague (2). It should be added, however, that, up to the end of 1946 plai had not been sorted by size category.

In Rye Bay the 1945 landings of plaice a demersal fish reached a high record for the peri since the outbreak of war, probably owing to t fact that night and day fishing was permitted a that an increased number of larger boats we working from Rye. Between 1945 and 1946, ho ever, there was a sharp fall, the plaice landed Hastings being less than any catch since 1940. F Rye Bay as a whole, the plaice catch fell to figure similar to that obtaining between 1941 a 1943, and the total demersal fish catch was w below the yield for this period. (Table 13. S also Table 5 in Vol. II, Ann. Biol.)

At Hastings the plaice were separated i categories and it is clear from an inspection these figures that there has been a substanti decrease in the category "large" in 1945 and 19 compared with the preceding years. This catego also decreased slightly between 1945 and 194 "Small" plaice showed an increase in 1945 a 1946 compared with the earlier years, but betwe 1945 and 1946 there was a slight decrease in t proportion of this category. These changes are in conformity with what should be expected fr the changes in the age distribution of the popu tion shown in Figure 3 and in Figure 3 of t earlier paper on this subject in Vol. II of t *Annales Biologiques*.

The reduced total catch of plaice from Rye B taken together with the fall in the catch per hou absence from port of the fishing vessels engag is an indication of the effect of increased fishi

t in Rye Bay and elsewhere from 1945 on-
s, and it is clear that the local plaice fishery
46 was proceeding to adjust itself to a lower
of production.

Relation between Weight and Length.

(Tables 7, 8 and 9).

he formula relating weight to length used in
liscussion on the relation between the weight
length of Rye Bay plaice in my paper in
II of this publication has been applied to the
roups of plaice from the three areas dealt
in this paper.

Veight increased by a relatively greater power
e length in the III, IV and V groups for Rye
plaice than for either of the other two areas.
the two North Sea areas, the power "*n*" by
n length is related to weight was on the whole
er in the more northerly area.

he value of "*n*" for the age-groups II, III and
it Rye Bay was considerably less than that found in the previous year, so that although the fish of these groups were heavier than in 1945. they were not so heavy for their length. It is possible that the lower population density in 1946 permitted the growth of individuals of these groups to a point where the conditions of assimilation reduced the weight for size. These conditions might be fulfilled if a fish had a bigger feeding ground. but the food on the ground was less abundant and more effort had to be exerted in finding it. Unfortunately, there is no evidence on the availability of plaice food in these two years. It has also to be borne in mind, that, in view of the differences between the male and female metabolism, an alteration in the sex-ratio might account for these changes in the value of "*n*".

Literature.

1. Bückmann, A. Rapp. et Proc. Verb. CXIV. 1944.
2. Holt, S. Report of Special Meeting on the Effect of the war on the demersal fish of the North Sea. (In preparation).

Table 1. Quantities (in tons) of Demersal Fish landed in 1946 at the Port of IJmuiden.

Species	Market categories	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total Quantity
Brill		26·4	51·0	19·0	7·6	104·1
Cod						
	Large >72 cm.	1,869·5	868·1	977·2	225·3	3,940·2
	Small I 55—72 cm.	195·0	205·8	442·5	84·7	928·0
	Small II 35—55 cm.	64·5	144·1	322·3	74·8	605·7
	Small III <35 cm.	8·8	13·8	24·9	47·4	95·0
	Total	2,137·9	1,231·8	1,766·9	432·2	5,568·8
Dab		133·4	169·7	75·6	58·8	437·6
Flounder		34·8	23·0	18·8	14·2	90·7
Gurnard and Latchet		34·7	129·7	77·8	47·8	290·0
Haddock						
	Large >50 cm.	24·0	157·2	134·7	64·3	380·2
	Large medium 44—50 cm.	36·7	197·5	165·6	86·2	486·0
	Small medium 37—44 cm.	73·7	361·8	425·6	254·8	1,116·0
	Small I 30—37 cm.	37·2	196·7	388·5	275·6	898·0
	Small II 25—30 cm.	81·1	714·5	916·9	866·2	2,578·6
	Small III <25 cm.	0·3	0·2	46·1	1·6	48·2
	Total	253·0	1,628·0	2,077·4	1,548·6	5,507·0
Hake		129·2	559·0	56·4	11·4	756·1
Ling		9·0	20·6	10·1	12·4	52·1
Plaice						
	Large >50 cm.	28·9	63·7	49·6	61·3	203·4
	Large medium 40—50 cm.	147·5	306·1	168·5	88·8	711·0
	Small medium 35—40 cm.	898·7	760·0	332·6	104·1	2,095·4
	Small II 27—35 cm.	713·9	1,236·6	614·9	137·2	2,702·5
	Small III 21—27 cm.	168·4	414·5	481·8	164·9	1,229·6
	Small IV 15—21 cm.	23·3	88·9	33·1	—	145·3
	Total	1,980·7	2,869·9	1,680·6	556·3	7,087·4
Saithe		35·9	69·7	43·5	65·8	214·9
Sole						
	Large >37 cm.	28·3	110·7	34·5	43·4	216·9
	Large medium 32—37 cm.	270·3	371·6	156·4	166·0	964·4
	Small medium 29—32 cm.	100·6	179·7	76·7	72·6	429·5
	Small I 26—29 cm.	27·3	43·0	23·3	27·8	121·4
	Small II 23—26 cm.	5·0	5·9	7·6	11·5	30·2
	Small III 15—23 cm.	2·2	3·6	4·6	3·7	14·1
	Small IV <15 cm.	—	—	0·6	—	0·6
	Total	433·7	714·6	303·7	325·0	1,777·0
Turbot		60·0	171·4	207·3	133·4	572·1
Whiting		883·0	850·2	796·1	664·8	3,194·1
Other species		53·3	248·1	116·8	65·1	483·4
Total		6,205·2	8,736·7	7,249·9	3,943·5	26,135·4

The Dutch Fishery for Demersal Seafish in 1946.

By

L. K. Boerema and W. Ros.

the Vol. II of this series B a e r e n d s has iven a survey of the Dutch fisheries during ıe years 1939—1945. Referring to this survey re now giving the corresponding data for the h sea fisheries in 1946. For the sake of com- on some of B a e r e n d s' data are given here ı.

able 1 shows the total landings and their osition at the principal fishing port of the erlands, IJmuiden, and in Table 2 a summary ven of the number of days absence (or of ges), the total quantities of the fish landed the quantity of fish landed per days absence voyage) of the different kinds of fishing ls fishing from the port of IJmuiden.

he number of days absence of the steam ers does not give a correct idea of the activity e fleet of steam trawlers, since quite a large er of them have occasionally landed their es directly in England. This was especially ase in May, November and December 1946, s of no importance in the other months.

ıese voyages are not included in Table 2. In y, therefore, the increase of the number of absence of the Dutch steam trawlers in 1946 mparison with 1945 is greater than is shown is table.

ıe number of voyages of the motor luggers in orresponding months of 1945 and 1946 has ned at about the same level, but the number ages of the small motor vessels has increased lerably.

ıe figures for the catch per days absence for eam trawlers in 1946 have somewhat de- d as compared with the corresponding months 45. The exceedingly high figures for the first months after the war have not been reached in June, July and August 1946.

e ratio between the average catch of the trawlers per days absence in 1946 and 1945 3. This average catch is calculated by divid- e figures for the total catch of the whole by those for the total number of days e.

In the luggers this ratio is 1·05 and in the small motor vessels it amounts to 1·18. These figures do not prove, however, that the density of the fish population on the grounds fished by these vessels has been greater in 1946 than in 1945. Especially in the case of the small motor vessels the mean fishing capacity of the vessels has increased considerably. Many vessels that had been taken by the Germans during the war returned after recovering to the fishery and generally they had a greater fishing capacity than the vessels already in use. This greater capacity does not only mean that their fishing power per unit of time exceeds that of the average vessel of 1945, but also that their number of days per voyage is larger. The ratio 1·18 between the catches per voyage in 1946 and 1945 is therefore not a reliable measure for the density of the fish population. As also the luggers had a somewhat higher fishing capacity in 1946 than in 1945, even the ratio of 1·05 for the luggers cannot be applied without a correction as a measure for the density of the population. Perhaps the ratio of 0·83 for the steam trawlers will give the nearest approximation to the ratio of the density of the fish population in 1946 and 1945. Certainly the density in 1946 was still far above that before the war. As compared with 1933 and 1934 the ratio derived from the steam trawlers would be 1·95, from the luggers 3·12 and from the small motor-vessels 3·58.

The catch per days absence of the steam trawlers shows a sharp decline in the first few months after fishing was resumed in June 1945, but it remained on a rather constant level in 1946. In Table 3 and Figure 1 is shown that the catches per days absence of c o d are to a high degree responsible for the development of the total catch, and especially the sharp decline in 1945 has been caused by a decline in the catches of cod.

The course of the h a d d o c k fishery is rather irregular. When we compare the catches in 1945 and 1946 it appears that a level as high as in November 1945 could not be obtained in 1946. The quantities landed of this species are, however,

Table 2. Number of Days Absence or of Voyages, Total Qantity landed in tons and Quantity landed per Days Absence in kg. of different types of vessels fishing from the Port of IJmuiden 1946.

Month	A. Steam Trawlers			B. Motor Luggers (trawl fishery)			C. Small Motor Vessels		
1945	No. of days absence	Quantity landed (tons)	Quantity per days absence (kg.)	No. of voyages	Quantity landed (tons)	Quantity per voyage (kg.)	No. of voyages	Quantity landed (tons)	Quantity per voyage (kg.)
June	10	53	5,307	35	183	5,231	93	75	803
July	128	656	5,120	82	476	5,805	232	199	85
Aug.	279	1,114	3,994	92	715	7,775	206	114	55
Sept.	222	706	3,179	68	422	6,205	183	151	82
Oct.	364	1,209	3,322	39	222	5,682	483	599	1,24
Nov.	277	976	3,525	40	208	5,206	533	552	1,03
Dec.	537	1,069	1,992	39	118	3,031	94	40	42
Total year	1,817	5,783	3,183[1])	395	2,344	5,935	1,824	1,730	94
1946									
Jan.	400	1,150	2,874	65	519	7,983	128	173	1,35
Feb.	416	948	2,279	86	469	5,452	149	177	1,18
March	504	1,165	2,311	131	763	5,827	873	703	80
April	473	1,342	2,838	117	887	7,581	799	876	1,09
May	357	938	2,626	72	442	6,137	617	894	1,44
June	501	1,431	2,596	63	383	6,082	474	606	1,27
July	607	1,903	3,136	64	491	7,667	475	793	1,67
Aug.	411	1,287	3,132	49	316	6,449	459	573	1,24
Sept.	333	723	2,172	41	178	4,348	223	225	1,01
Oct.	310	865	2,789	41	211	5,149	748	702	93
Nov.	319	649	2,034	43	197	4,574	320	228	71
Dec.	311	705	2,267	27	124	4,575	161	119	73
Total year	4,942	13,106	2,652	799	4,980	6,233	5,426	6,069	1,11

[1]) To avoid too much influence of the abnormal large catches of the first months the average is calculated b dividing the total catch by the numbers of days absence and not by dividing the sum of the monthly figures b the numbers of months, as has been done in Ann. Biol. II.

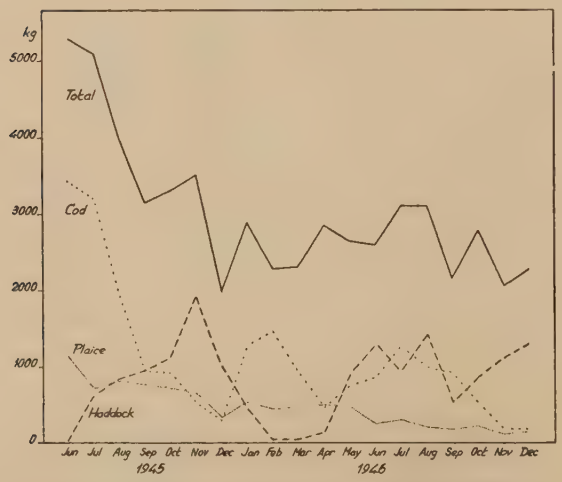


Fig. 1. Total Catch per Days Absence by Dutch Steam Trawlers and Catch of Cod, Haddock and Plaice.

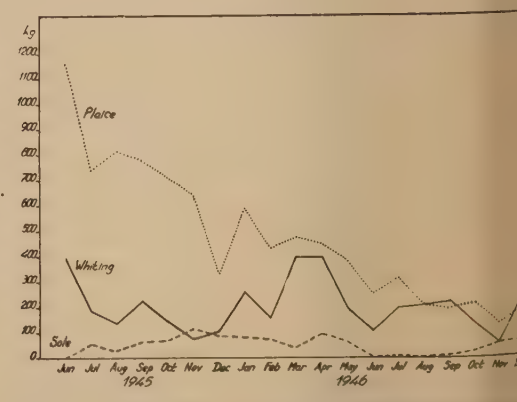


Fig. 2. Catch per Days Absence by Dutch Steam Traw of Plaice, Whiting and Sole.

Table 3. Number of Days Absence, the Quantities of the Different Fish Species Landed in tons, and the Catch per Days Absence in kg., for the Steam Trawlers at IJmuiden.

Month	Number of days absence	Cod		Haddock		Sole		Plaice		Whiting	
		Quantity landed (tons)	Quantity per days absence (kg.)	Quantity landed (tons)	Quantity per days absence (kg.)	Quantity landed (tons)	Quantity per days abs. (kg.)	Quantity landed (tons)	Quantity per days absence (kg.)	Quantity landed (tons)	Quantity per days absence (kg.)
45											
ne	10	34	3,418	—	30	—	2	12	1,161	4	393
ly	128	410	3,201	80	623	7	55	94	736	24	188
ug.	279	547	1,960	233	836	8	30	226	810	39	139
pt.	222	213	962	206	927	14	65	173	779	50	225
ct.	364	344	945	416	1,142	25	69	259	712	53	147
ov.	277	147	532	533	1,923	32	117	177	639	22	78
ec.	537	155	289	538	1,001	47	88	180	335	57	106
otal year	1,817	1,850	1,018	2,005	1,104	134	74	1,121	617	249	137
46											
n.	400	505	1,263	171	428	33	83	234	586	104	261
eb.	416	597	1,435	12	28	31	74	179	430	67	160
arch	504	462	917	16	31	21	42	238	472	201	399
pril	473	217	458	75	159	45	95	212	448	189	399
ay	357	273	765	318	892	24	66	136	382	69	195
ne	501	421	841	659	1,314	5	9	126	251	55	109
ly	607	779	1,283	582	959	6	10	192	317	118	195
ug.	411	411	1,001	581	1,413	2	6	86	208	86	208
pt.	333	311	934	181	543	3	10	65	196	74	222
ct.	310	167	538	259	835	8	27	66	212	41	133
ov.	319	63	198	358	1,122	17	52	42	132	19	58
ec.	311	59	190	407	1,308	19	61	58	186	87	219
otal year	4,942	4,266	864	3,617	732	214	43	1,633	331	1,109	224

Table 4. Percentage of Total Quantity landed to the Class "Small", at the Port of IJmuiden.

	Cod		Haddock		Plaice				Sole			
	< 72 cm.		< 37 cm.		< 35 cm.		< 27 cm.		< 29 cm.		< 26 cm.	
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946
1st Quarter	—	13	—	47	—	46	—	10	—	8	—	1·7
2nd Quarter[1])	40	30	30	56	88	60	57	18	49	7	15	1·3
3rd Quarter	33	45	31	65	59	67	16	31	15	12	3·5	4·2
4th Quarter	34	48	46	70	58	54	16	30	8·5	13	0·9	4·7

[1]) In 1945 fishing has only occurred in June.

Table 5. Quantities (in tons) of Demersal Fish landed in 1946 at the Port of Den Helder.

Species	Market categories	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total Quantity
Brill		1·0	7·5	5·1	1·6	15·2
Cod		70·5	23·4	3·1	11·5	108·4
Dab		76·1	30·6	43·2	16·7	166·6
Flounder		3·9	2·1	10·5	4·0	20·5
Plaice	Large, Large medium and Small medium	120·0	95·0	38·8	18·7	272·5
	Small II	127·2	118·7	52·6	19·6	318·1
	Small III	210·4	106·7	98·8	36·3	452·2
	Small IV	92·8	28·2	3·1	—	124·1
	Total	550·4	348·7	193·4	74·6	1,166·9
Sole		31·6	151·9	76·1	51·7	311·3
Turbot		2·5	12·2	11·7	5·6	31·9
Whiting		152·7	132·1	65·8	83·9	434·6
Other species		7·8	9·7	10·3	9·0	36·7
Total		896·3	718·2	419·1	258·6	2,292·1

much affected by the grounds where the trawlers are fishing as the haddock contrariwise to the situation after the first world war had not spread over the Southern North Sea. This also was the cause of the small catches of haddock in the first months after the war.

The catches of plaice show a regular decline since the resumption of the fishery in 1945 (Fig. 2). This can be explained by the assumption that the stock has diminished to a considerable degree.

The catches of sole also show a decline but to a smaller extent than those of the plaice.

The whiting does not give a distinct indication of a decline in the catches per days absence.

As a whole we see more or less distinctly a decrease in the separate species, most pronounced in the plaice and least in the whiting. In the total catch during 1946 this decrease is but little marked, by the, partly normal, seasonal fluctuations of the different species, which counteract in the total curve.

In order to determine how far this decline has been accompanied by a decrease in the length of the fish, the percentages of the class "small" are given in Table 4. In the small cod we see an increase in the percentage in the 3rd and 4th quarter of 1946 as compared with the same period in 1945. The same holds good for the haddock, for the plaice < 27 cm. and for the sole < 26 cm. A general decline in the size of all kinds of fishes

Table 6. Percentage of Total Quant landed to the Class "Small" at the P of Den Helder.

	Plaice			
	< 35 cm.		< 27 cm	
	1945	1946	1945	1
1st Quarter	—	78	—	
2nd Quarter	—	72	—	
3rd Quarter[1])	82	80	54	
4th Quarter	73	75	35	

[1]) In 1945 fishing has occurred only in August September.

has occurred in 1946 as compared with 1945, the percentages are still considerably beneath th of 1938 and 1934 as given by Baerends Ann. Biol. II.

In order to give an idea of the composition the stock in the coastal area the quantities of landed at the port of Den Helder in 1946 shown in Table 5; for a comparison with catches in 1945 we refer to Table 6 in Ann. B II. In Table 6 the percentages are given of categories of plaice < 35 cm. and < 27 cm. decrease in the length of the plaice does not se to be so marked as in the corresponding figu for IJmuiden.

ring.

The East Anglian Herring Fishery 1946.

By

William C. Hodgson.

s only possible at this stage to give a brief mmary of the work done in connection with e East Anglian herrings of the 1946 season. ne sampling was carried out according to d published in Rapp. et Proc.-Verb. Vol. No. 1939 and in all, 27 samples of herring were ned in the laboratory and more than 150,000 vere measured on the markets at Yarmouth owestoft.

October it soon became apparent that the gs which were visiting the East Anglian coast different from the normal run of fish. They rather bigger than usual and, instead of being (maturity stage IV—V)) they were inclined soft (stage V—VI) and this difference was d quite independently by the fishermen and ants. The amount of blood in the body cavity d that these fish were ready for spawning.

nother feature of the season was the appear- of older fish many of whose scales were very ılt to read. Some, indeed, were quite unread- nd it was almost impossible to say whether n of the fish were seven, eight or nine years This fact has made the age determinations of ovember herrings very unreliable.

The details of the examination of the autumn shoals, vertebrae etc., have not yet been completely worked up, so only a general account of the fishery can be included at this stage.

The Average Catch.

During the Season 313 steam and 57 motor drifters were working from Lowestoft and Yarmouth and the total amount of fish landed was 354,389 crans (approximately 700,000 hektolitres).

There were 2,575 landings at Lowestoft and 4,501 at Yarmouth and the average catches per landing were as follows:

Lowestoft	51·6 crans
Yarmouth	49·2 „

These figures are considerably lower than the 1945 averages of 64·8 and 58·7 for the two ports, but still higher than the pre-war averages. It may be that the catches of the last two years are already reducing the available stock of fish which was unaffected by fishing during the war years.

Age.

In Figure 1 the changes in the fishery are shown week by week throughout the season. Each histogram represents the actual number of herrings of each age in an "average landing" and it is clear that the four-year-old fish were the main group.

It is well known that the date of the full moon plays an important part in the East Anglian season and it has been shown that in general the heaviest landings are made during the seven-day period of which the middle day is the date of the full moon. In the season under review the October full moon occurred on the 10th of the month, and the November full moon on the 9th and it is seen that the three-year-old fish reached a maximum abundance during the week following the October moon.

The four-year-old herring had two maxima, one in October and the second in November, while the five-year-olds reached their maximum in November. As has already been explained too much reliance cannot be placed on the proportion of the older age-group in November, especially the 7, 8 and 9-year-old fish.

In "Lunar Influence on the East Anglian Herring Fishery" (Journal du Cons. Vol. IX, No. 2, 1934) it was shown that the characteristics of a fishing season varied according to the dates of the full moon, and that the best catches were made when the first full moon of the season occurred in the second week of October. Under these conditions two periods of very heavy landings occur, and Figure 1 shows that the herrings which came to East Anglia during the 1946 season behaved in a normal manner.

The occurrence of large numbers of herrings which are not usually encountered in these shoals may be due in some measure to the prolonged series of easterly and north-easterly winds which prevailed throughout the year, and the advanced stage of maturity observed in the October fish suggests that herrings from the more northern grounds migrated to East Anglia.

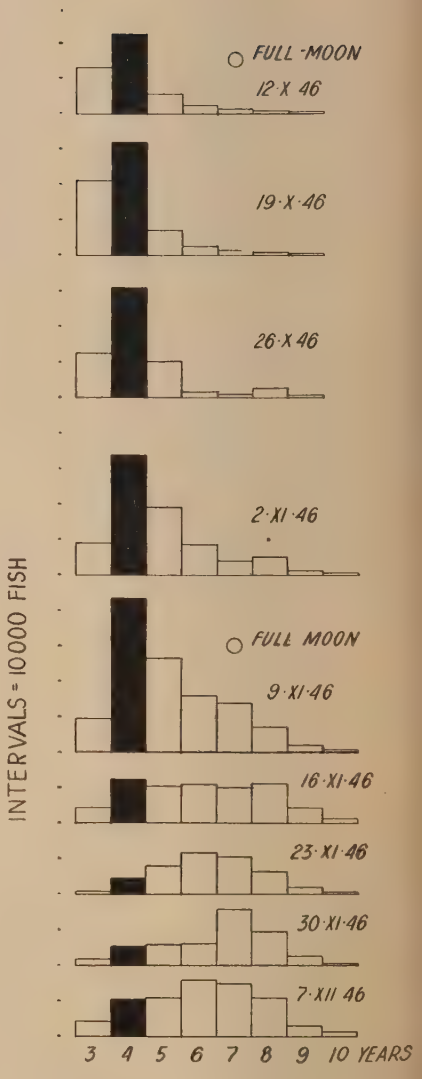


Fig. I AVERAGE LANDING PER WEEK 1946

Hareng du Sud de la Mer du Nord et de la Manche Orientale.

Par

J. Ancellin.

OUS communiquons ici les résultats d'ensemble des travaux effectués depuis 1926 par M. Le Gall, Directeur de l'Office tifique et Technique des Pêches Maritimes, sur arengs du sud de la Mer du Nord et de la he Orientale. Ces travaux ont été interrompus ant la guerre; nous les avons repris depuis à Boulogne S/M et nous ajoutons aux résulntérieurs ceux des premières recherches effecaprès la guerre. Celles-ci feront d'ailleurs t d'un exposé complet dans un rapport que nous réservons de publier ultérieurement.

a statistique I se rapporte à la moyenne vertéon peut voir que de 1931 à 1937 elle diminue ièrement dans les groupes Dyck-Sandettié et e même on constate une nette tendance à la ution dans le groupe I. Ce phénomème est cable en admettant l'hypothèse d'une pénétraprogressive, vers le sud, des harengs du type *k-herring*" (moyenne vertébrale = 56·50). fois une telle pénétration semble s'être arrêtée urs des années de la guerre; elle aurait même lace d'après nos premières observations, à une pénétration, en sens inverse, des harengs du Manche Orientale en Mer du Nord[1]).

[1]) Le groupe II (harengs du sud de l'embouchure de la e) n'est pas représenté dans les statistiques de 1945, he n'ayant pas eu lieu dans cette région.

Il ne nous est malheureusement pas possible actuellement d'établir dans quelle mesure ce fait est en rapport avec les conditions hydrologiques.

La statistique II représente la taille moyenne observée des différentes classes pour les années 1933—37 et 1945 (tailles calculées au cm. près).

La statistique III représente les pourcentages établissant l'importance comparative des différentes classes pour les années 1928—37 et 1945. On note l'importance des classes 1921, 1924, 1927, 1929, 1931, 1932, 1934. D'après les résultats obtenus en 1945, suivant la méthode habituelle de lecture des écailles, les classes anciennes 1936, 1937, 1938 sont encore très bien représentées.

La classe 1942 est bonne, à l'encontre des 3 classes précédentes, nettement déficitaires (voir figure 1).

La physionomie de la pêche du hareng pendant la campagne d'hiver 1945—46 a été caractérisée par l'apparition tardive des harengs "pleins" (Stade V) sur les frayères au large de Boulogne (début de la pêche au filet dérivant = vers le 13 novembre.)

Les concentrations de harengs "guais" ont ensuite commencé vers le 15 décembre à faire l'objet d'une pêche assez active qui s'est prolongée jusqu'en mars, le long du littoral belge, entre la Panne et Blankenberghe.

Statistique I. Moyenne vertébrale (1928—37 et 1945).

ées	A) Groupe Dyck—Sandettié. Moyenne Vertébrale	Nombre d'individus examinés	B) Groupe I (Nord—Somme). Moyenne Vertébrale	Nombre d'individus examinés	C) Groupe II (Sud—Somme). Moyenne Vertébrale	Nombre d'individus examinés
8	56·61	122	56·50	232	56·79	217
9	56·52	898	56·66	431	56·76	478
0	56·64	925	56·67	446	56·74	484
1	56·65	774	56·78	184	56·77	433
2	56·64	728	56·60	385	56·72	393
3	56·57	551	56·61	545	56·75	329
4	56·53	1,038	56·49	540	56·70	884
5	56·51	610	56·46	343	56·68	392
6	56·46	694	56·53	691	56·62	584
7	56·42	792	56·48	101	56·54	639
			De 1939 à 1944 = néant			
5	56·54	501	56·73	61		

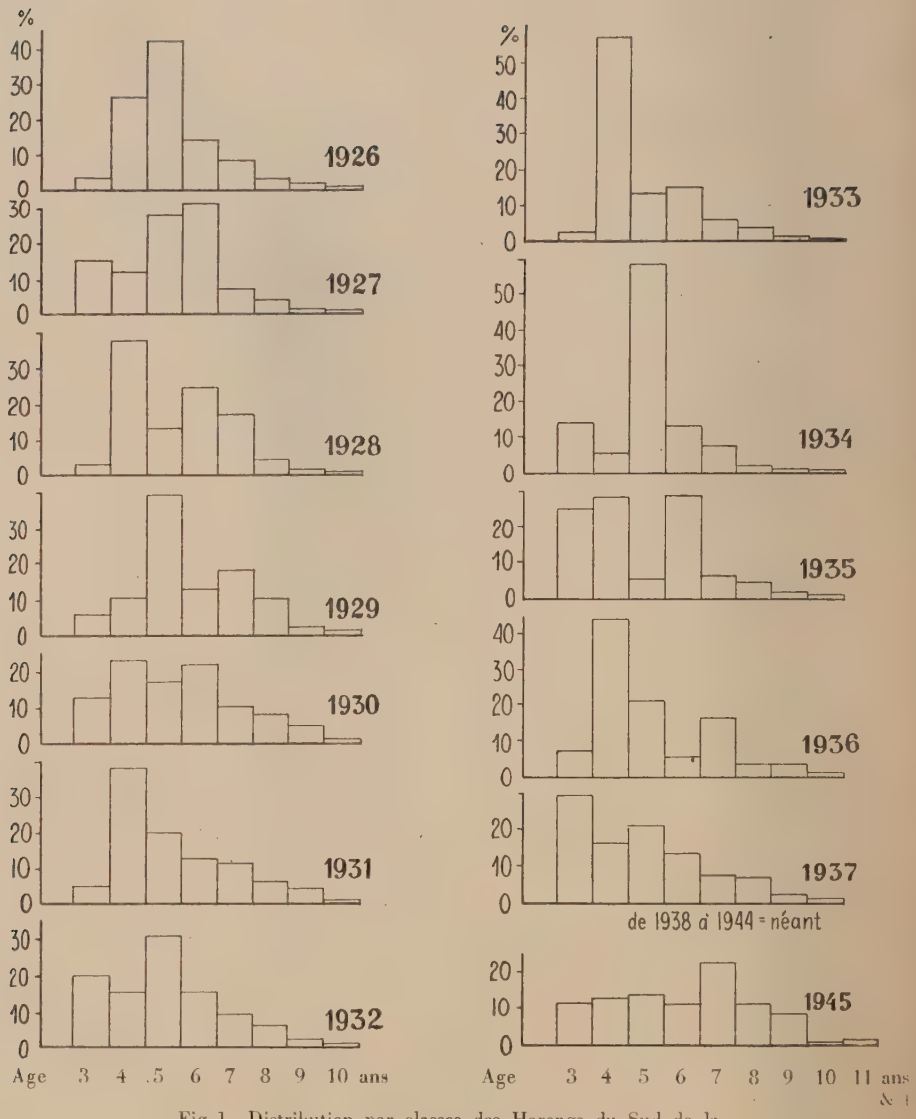


Fig. 1. Distribution par classes des Harengs du Sud de la Mer du Nord et de la Manche Orientale. (1926—1937 et 1945)

Statistique II.
Taille moyenne des différentes classes (1933—37 et 1945).

roupe Dyck—Sandettié.

1945	1937	1936	1935	1934	1933
22·56	22·45	22·11	22·56	22·12	22·31
24·47	24·25	24·33	23·98	23·62	23·64
25·73	24·81	25·27	25·30	24·95	24·65
26·59	26·19	26·11	25·88	26·02	25·57
26·80	26·94	26·60	26·58	26·32	26·48
27·05	27·10	27·21	—	26·79	27·27

B) Groupe I (Nord—Somme).

	1937	1936	1935	1934	1933
3	23·03	23·10	23·09	22·74	—
4	24·70	24·57	24·10	23·74	23·90
5	26·00	25·40	25·30	24·90	25·25
6	—	26·40	26·08	25·64	25·70
7	—	26·41	26·50	26·83	26·18
8	—	26·66	—	—	—

oupe II (Sud—Somme).

1937	1936	1935	1934	1933
22·86	22·68	23·40	22·50	—
24·03	24·53	23·99	23·71	24·10
25·83	25·13	25·65	25·11	25·45
36·30	25·93	26·06	25·99	25·96
26·85	26·45	26·58	26·42	26·97
27·17	27·00	—	—	—

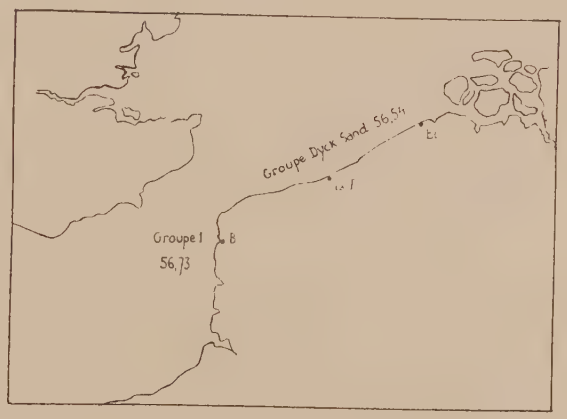


Fig. 2. Pêcheries et moyennes vertébrales observées en 1945.

Statistique III.
Importance comparative des différentes classes (%).
(Groupe "Dyck—Sandettié", Groupe I et Groupe II réunis) — [1926—37] et 1945 —

Anneaux d'hiver		2	3	4	5	6	7	8	9	10 & +
Age		3ans	4ans	5ans	6ans	7ans	8ans	9ans	10ans	11ans & +
Années	Nombre d'individus									
1926	317	3·4	26·2	*42·4*	14·4	8·4	3·4	1·6	0·2	—
1927	602	*15·0*	12·4	28·6	*31·5*	7·6	4·6	0·9	0·4	—
1928	2,105	3·0	*37·5*	12·8	24·5	*17·2*	3·9	0·9	0·1	—
1929	1,628	5·9	10·6	*38·7*	12·8	18·3	*10·6*	2·1	1·0	—
1930	1,895	*13·6*	23·2	17·4	*22·6*	10·1	7·8	*4·7*	0·6	—
1931	1,435	4·7	*38·0*	20·8	12·8	*11·2*	6·6	4·6	1·0	—
1932	1,506	*20·0*	15·5	*31·0*	15·4	9·0	*5·9*	1·9	1·1	0·3
1933	1,654	2·4	*57·7*	13·3	*15·3*	5·8	3·5	1·3	0·5	0·2
1934	2,438	*13·5*	5·5	*58·5*	13·0	*7·4*	2·0	0·6	0·4	0·2
1935	1,476	*24·6*	*28·1*	5·1	*29·2*	6·1	4·3	1·6	0·7	0·1
1936	2,381	6·9	*43·6*	21·1	5·1	*15·5*	3·0	*3·1*	1·1	0·3
1937	1,490	*34·6*	15·9	*20·9*	12·9	7·0	*6·6*	1·3	0·4	0·2
De 1939 à 1944 = néant										
1945	575	*11·30*	12·17	12·52	10·26	*22·26*	*10·43*	*8·0*	0·52	

Concentration de Harengs Guais sur la Côte Belge au cours de l'Hiver 1945—46.

Par

Ch. Gilis.

A. Pêcherie.

I. Lieu et époque de pêche.

Depuis l'hiver 1942—43 les harengs guais boudent les eaux françaises et viennent de préférence s'installer sur la côte belge, pour y passer, après la fraie, leur période de convalescence.

La campagne de harengs guais eut un début assez précoce et débuta le 22 novembre 1945. C'est entre Dunkerque et Nieuport, où la concentration se localisa jusque fin décembre, que les premières captures furent enregistrées. A partir de janvier la pêcherie s'étendit jusque devant Ostende pour aboutir en février et mars à la hauteur de Zeebrugge, ce qui fait que la concentration se déplaça, comme les trois hivers précédents, de l'Ouest vers l'Est.

Les dernières captures furent débarquées le 25 mars 1946, de sorte que la dernière campagne harenguière dura quatre mois. Comparativement à la durée des campagnes précédentes, lesquelles ne se prolongèrent guère ou peu au delà de trois mois, la dernière fut ainsi relativement longue.

II. Flotille et méthodes de pêche.

Au total 345 navires participèrent plus ou moins régulièrement à l'exploitation de la concentration de harengs guais 1945—46: 245 du type de navires I (canots et petits côtres crevettiers) dont la force motrice varie entre 10 et 75 C.V.; 58 du type II (chaloupes côtières) dont la force motrice est comprise entre 80 et 115 C.V.; 40 du type III (chalutiers moyens) qui développent 120 à 230 C.V. et 2 chalutiers hauturiers de 240 C.V.

Toutefois, à partir du 10 février 1946, tous les chalutiers dont la force motrice développa plus de 120 C.V. furent éliminés de l'exploitation des bancs de harengs. Cette mesure fut prise pour remédier à une baisse formidable des prix du hareng, qui, à certains moments, descendirent en dessous de 0·25 Fr. le kilo.

Outre les navires belges, environ 300 chalutiers français de 20 à 200 C.V. poursuivirent jusque dans nos eaux territoriales les bancs de harengs guais. Ceci en vertu d'un accord conclu entre France et la Belgique et par lequel les pêche des deux nations étaient autorisés d'exploiter, p dant l'hiver, les bancs de harengs jusque dans eaux territoriales tant françaises que belges.

On peut donc estimer que 500 à 600 chaluti mirent continuellement la concentration à contri tion.

Depuis la campagne 1942—43 le filet à l'é lage a été complètement abandonné pour ce exploitation et exclusivement remplacé par le fi à harengs, écarté par des panneaux (Otter traw

III. Apports.

Au cours de l'hiver 1945—46 les pêche belges débarquèrent au total 6,530 pêches, dont poids s'éleva à 26,358,947 kg., soit en moyer 4,036 kg. par débarquement. Il est à noter que durée d'une pêche ne se prolongea jamais au d de quelques heures et qu'elle se borna le p souvent à 2 ou 3 traînées d'une heure.

Ce sont les français qui s'attribuèrent la p du lion, leur capture saisonnière étant estimée 45 millions de kilos.

Du côté belge le record du nombre d'appo fut enregistré en décembre avec 1,976 débarq ments; celui du poids mensuel en janvier a 9,792,404 kg. ainsi que celui du poids par pê avec 5,239 kg. C'est en février que la producti de la concentration obtint son point culminant a 87 kg. par journée de pêche pour 1 C.V. dévelop

Il peut paraître assez anormal que le maxim du poids moyen fut obtenu en janvier, alors la concentration fut plus dense en février. C anomalie s'explique par l'élimination des gra chalutiers, dont question plus haut, à partir du février, mesure qui entraîna une diminution a remarquable de la capacité de capture de la fl restée en pêche. En effet, la moyenne de la fo motrice développée par pêche fut ramenée de C.V. à 54 C.V.

Tableau 1. Campagne de harengs guais 1945—46: Apports mensuels, poids moyen par pêche et par C. V. développé.

Mois	Nombre de pêches	Poids débarqué en kg.			C. V. développés	
		Total (en 100 kg.)	par pêche	par C. V.	Total (en 1000)	par pêche
Nov.	500	413	826	15·02	27	55
Déc.	1,976	6,300	3,188	50·45	125	63
Janv.	1,869	9,792	5,239	81·23	121	64
Févr.	1,223	5,747	4,699	86·86	66	54
Mars	962	4,107	4,269	82·89	50	51
Saison	6,530	26,359	4,036	67·82	389	60

ı cours de la guerre la densité des concentra- de harengs guais atteignit un niveau jusqu' inconnu. Leur production par journée de pour un C.V. développé oscillait entre 119 kg. —42) et 164 kg. (1942—43). Pour l'en- e des quatre saisons de guerre, cette moyenne imée à 145 kg.

tte productivité inaccoutumée fut surtout le t de l'interruption quasi-complète, pendant les hostilités, de la Grande Pêche aux Harengs d'Automne sur la côte Est de l'Angleterre et dans la Manche Orientale. Cette pêcherie constitue en effet un prélèvement considérable sur nos concentrations de harengs guais. Dès lors, il n'est pas étonnant que sa reprise (en 1945) entraîna une forte baisse de productivité de la concentration de harengs guais au cours de l'hiver 1945—46, laquelle fut ramenée de 159 kg. à 68 kg. par C. V. développé.

Tableau 2. Productivité des concentrations annuelles de harengs guais pendant la période 1941—42 à 1945—46.

Concentration	Nombre de journées de pêche	Poids débarqué (en 1000 kg.)	C. V. développés (en 1000)	Poids moyen par C. V. développé (kg.)
1941—42	2,383	10,007	84	119
1942—43	9,165	51,895	316	164
1943—44	9,379	58,120	449	130
1944—45	3,840	31,446	197	159
1945—46	6,530	26,359	389	68

B. Biologie.

re le 3 décembre 1945 et le 15 mars 1946, prélevé 28 échantillons de 25 harengs chait au total 700 individus.

ıme les années précédentes, ces échantillons étudiées aux divers points de vue de la ue usuelle: 1° taille, 2° poids, 3° sexe, 4° es gonades, 5° quantité de graisse mésentériâge, 7° vertèbres et 8° contenu stomacal. ant compte des recommandations d'Aberdeen , nous avons repris les calculs de la valeur 'après l'écaille.

le. La longueur est mesurée au centimètre nférieur, du bout du museau à l'extrémité le la caudale.

La taille des harengs soumis à l'analyse ariait entre 20 et 29 cm.

La taille moyenne pour l'ensemble des échanillons atteint 25·41 cm., rectifié 25·41 cm.+ ·50 cm. = 25·91 cm.

Tableau 3. Répartition et Pourcentage de chaque taille.

Taille en cm.	Nombre d'indiv.	Pourcentage
20	8	1·1
21	21	3·0
22	69	9·9
23	67	9·6
24	57	8·1
25	60	8·6
26	117	16·7
27	213	30·4
28	83	11·9
29	5	0·7

2° **Poids.** Le poids moyen du hareng atteignit 107 g., soit 9,35 individus au kilo.

3° **Sexe.** On compta 371 mâles et 329 femelles, soit respectivement 53 et 47 %.

4° **Stade des gonades.** 659, soit 94 % des harengs soumis à l'analyse, avaient les gonades vides (= stade VIII—II) ; 36, soit 5·14 % avaient encore quelques restes d'oeufs ou de laitances dans leurs gonades (= stade VII) ; 1 seul hareng avait les gonades mûres: laitances évacuables par simple pression (= stade VI) et 4 harengs avaient de très petites gonades, donc des individus primigènes (stade I).

5° **Graisse mésentérique.** 196 harengs, soit 28 % étaient totalement dépourvus de graisse (= 0) ; 485, soit 69 % montraient peu de graisse (= 1) ; 18, soit 3 % en possédaient assez bien (= +) et un seul avec beaucoup de graisse (= M).

6° **Age.** La concentration de harengs guais 1945—46 était constituée par 13 classes annuelles: 1943 à 1931 (harengs de 2 à 14 ans).

La concentration était surtout caractérisée:

1) par un riche contingent des harengs:
de la classe 1942, harengs de trois ans, 24·07 %
de la classe 1936, harengs de neuf ans, 18·77 %
de la classe 1938, harengs de sept ans, 16·48 %

2) par un contingent moyen des harengs:
de la classe 1941, harengs de quatre ans, 12·75 %

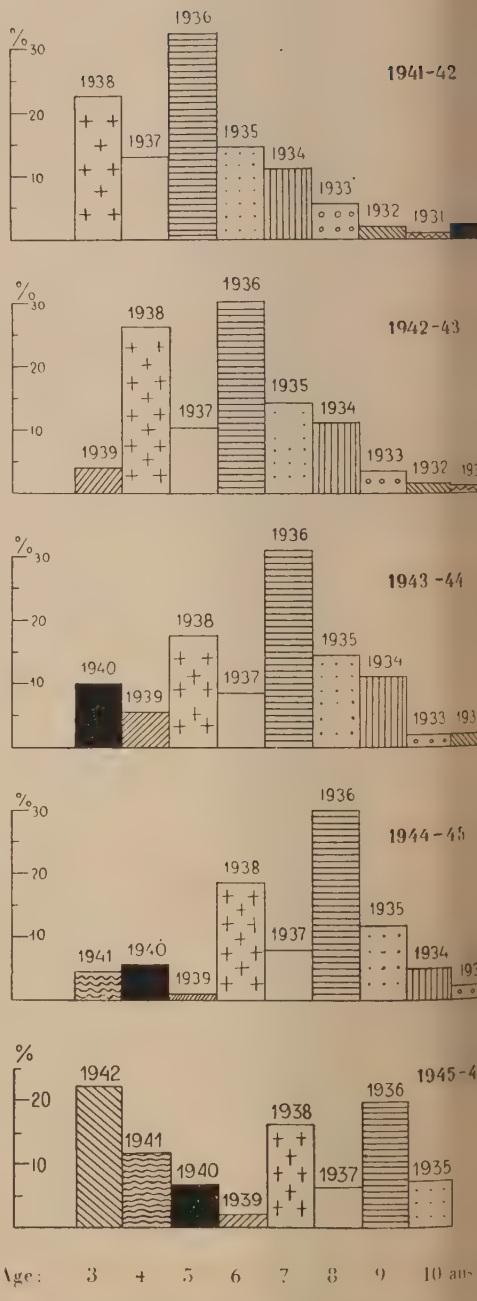
3) par un médiocre contingent des harengs:
de la classe 1940, harengs de cinq ans, 7·16 %
de la classe 1939, harengs de six ans, 2·72 %
de la classe 1937, harengs de huit ans, 5·73 %.

La classe de 1942 a une représentation (24·07 %) bien supérieure à la moyenne (11·60 %) calculée sur les six concentrations antérieures. Elle s'avère donc une très forte classe de recrutement.

Malgré son grand âge la classe de 1936 fournit encore un contingent considérable (18·77 %). Néanmoins cette génération est en déclin et il est à prévoir que sa représentation subira encore une forte baisse l'hiver prochain.

L'influence de la classe 1938, qui fut également une bonne génération, sera désormais réduite dans la constitution des concentrations futures, car les harengs qui la composent, sont aussi déjà relativement âgés.

Dès leur première apparition, les harengs de la classe 1941, ne se sont jamais montrés fort nombreux et malgré leur jeune âge, leur représentation dans les prochaines concentrations ne pourra guère s'améliorer de beaucoup.



Escalier biologique des Harengs Guais.

uant aux harengs qui composent les mauvaises es de 1940, 1939, et 1937, ils seront de plus lus rares dans les concentrations.
nfin, faute d'éléments d'appréciation concer- la classe de 1943, qui pour la première fois raîtra dans nos régions l'hiver prochain, rien ermet encore de prévoir ce qu'elle nous réserve. chesse dépendra surtout des conditions hydro- ues et biologiques que les larves de cette ation — et il y a toutes raisons de penser les ont été abondantes — ont rencontré au de leurs premiers stades de développement.

Tableau 4. Fréquence des classes d'âge.

Age	Année de Naissance	Nombre d'indiv.	Pourcentage.
2	1943	1	0·14
3	1942	168	24·07
4	1941	89	12·75
5	1940	50	7·16
6	1939	19	2·72
7	1938	115	16·48
8	1937	40	5·73
9	1936	131	18·77
0	1935	52	7·45
1+	1934—	33	4·73

e et âge. Tailles moyennes rectifiées (+ 0·50 cm.)

e moyenne des harengs
de la classe 1942: 22·92 cm.
„ „ „ 1941: 24·83 „
„ „ „ 1940: 26·00 „
„ „ „ 1939: 26·61 „
„ „ „ 1938: 26·41 „
„ „ „ 1937: 27·30 „

ur de L_1. (Longueur arithmétique de la pre- zone de croissance d'après l'écaille). — ne annoncé plus haut nous avons repris les ls de la valeur de L_1. Les mensurations ont sur les écailles de 680 individus et donnent ne longeuer moyenne de L_1, 10·87 cm. Cette nne est légèrement supérieure à celle que nous obtenue en 1930—31, lorsqu'elle fut portée 96 cm. Néanmoins, ces deux valeurs restent supérieures à celle évaluée par Hodgson pour le hareng du Sud de la Mer du Nord, soit 8·— cm. et inférieures à celle déterminée par Le Gall pour le hareng de la Manche, soit 11·88 cm.

Ces constatations indiquent que la croissance des individus qui constituent la concentration des hareng de notre zône côtière à une allure intermédiaire entre celle de la population de la Mer du Nord et celle de la Manche et confirmeraient que nous avons à faire ici avec un mélange des deux populations précitées.

Enfin, nous avons cru intéressant de calculer la valeur de L_1 pour chaque classe annuelle séparément. Ces résultats, que l'on trouve sur le tableau suivant, montrent des écarts assez remarquables entre l'allure de la croissance des différentes générations.

Pour le moment, nous devons nous borner à noter ces différences de croissance. Toutefois, si ces résultats devraient présenter un caractère de continuité, ils pourraient être d'un appoint utile pour l'élucidation de maintes questions concernant le "*curriculum vitae*" des harengs qui hantent chaque hiver nos régions.

Tableau 5. Valeur de L_1 en cm.

Classes annuelles	Nombre de mensurations	Longueur moyenne
1942	168	10·82
1941	86	10·84
1940	49	11·33
1939	19	12.44
1938	111	11.25
1937	138	11·06
1936	127	10·88
1935	48	9·78

7° Vertèbres. La moyenne vertébrale de la concentration 1945—46 atteignit 56·63. Le caractère polyspondylique de ces bancs de harengs était donc plus prononcé qu'en 1944—45, lorsque la moyenne vertébrale de la concentration fut évaluée à 56·57. Cette constatation pourrait indiquer une pénétration plus forte des harengs de la Manche en Mer du Nord, au cours de l'hiver passé.

Tableau 6. Répartition mensuelle de la moyenne vertébrale en 1945 - 46.

Mois	Nombre d'ind.	Nombre de vertèbres 54	55	56	57	58	59	Moyenne vertébrale
Déc.	200	1	9	87	89	14	—	56·53
Janv.	200	—	3	76	105	16	—	56·67
Févr.	200	—	5	64	115	15	1	56·71
Mars	100	—	1	44	50	5	—	56·59
Total	700	1	18	271	359	50	1	56·63
	%	0·1	2·6	38·7	51·3	7·1	0·1	

Selon la répartition mensuelle du caractère vertébral c'est en janvier et février que la population de la Manche fut la plus abondante.

8° **Contenu stomacal.** Parmi les 700 estomacs examinés, seulement 12 contenaient un peu de nourriture, laquelle était en majeure partie constituée par de débris de *Temora longicornis*. Ce copépode est très répandu dans nos régions et sa présence est aisément reconnaissable grâce à sa furca très caractéristique.

La continuité observée dans l'étude du contenu stomacal depuis 1930—31, indique suffisamment que les harengs s'abstiennent de toute nourriture pendant leur séjour sur notre côte. D'ailleurs aussitôt que l'appétit reprend, la concentration se disperse, dispersion qui signifie la fin de la campagne harenguière.

Transition Area.

INTRODUCTION.

ontributions to this report have been made by:
Aage J. C. Jensen, Denmark,
Erik M. Poulsen, Denmark,
Helge Thomsen, Denmark.
Alf Dannevig, Norway.
K. A. Andersson, Sweden.
A. R. Molander, Sweden.

A. Environment.

ography.

bservations of salinity and temperature of the ce and bottom water were made at the light- s "Anholt Knob" (central Kattegat) and kov Rev" (Great Belt) between October 1945 eptember 1946. Monthly means, based on a er of years, are given together with the devi- of the 1945/46 means from them. Also the residual currents (in cm./sec.) at Halskov re given for each month during this period. mperature and salinity measurements, at 1 m. the surface, have been made at Flødevigen, rendal, throughout the year 1946 (see p. 92).

nthic Food. Valuations of the sea bottom in imfjord were carried out in July and Sep- r 1946. On the whole the amount of 1st-class food was a little above the normal. The se of the stock of bottom invertebrates which in 1943 has continued.

B. Fish.

nd Larvae.

terial has been collected off the Norwegian ak coast; however it has not yet been l up.

Fish.

estigations on the abundance of **cod** of the ff the Norwegian Skagerak coast have been the 1946 year-class was found to be very

ice. Along the Danish coast the abundance 1946 year-class was determined by means Johansen trawl. In the Belts the number was above normal, in the Kattegat, however, below. A certain correlation between wind, salinity and temperature and the strength of the various year-classes was found. Along the Swedish Skagerak coast the 1946 year-class was above normal, along the Kattegat, however, considerably below normal.

In Danish waters the size and age compositions of commercial catches of plaice have been investigated. Near the Skaw the size of the plaice caught had increased. This was due to the large plaice which had accumulated during the war on the grounds closed to fishing. In other waters the size of the plaice had decreased owing to the entrance into the catches of the relatively good 1944 year-class.

The abundance of the age groups in the Limfjord was determined. In the western part of the fjord the stock was considerably above normal.

A report on the Danish transplantations within the Limfjord is given in conjunction with a survey of the yearly variations of anal fin rays in plaice from the Thyborøn area. The year-classes born in the extremely cold winters of 1940 to 1942 showed very low numbers of fin rays.

Dab and Eel. Investigations were made into the size of the stocks of these fish in the Limfjord.

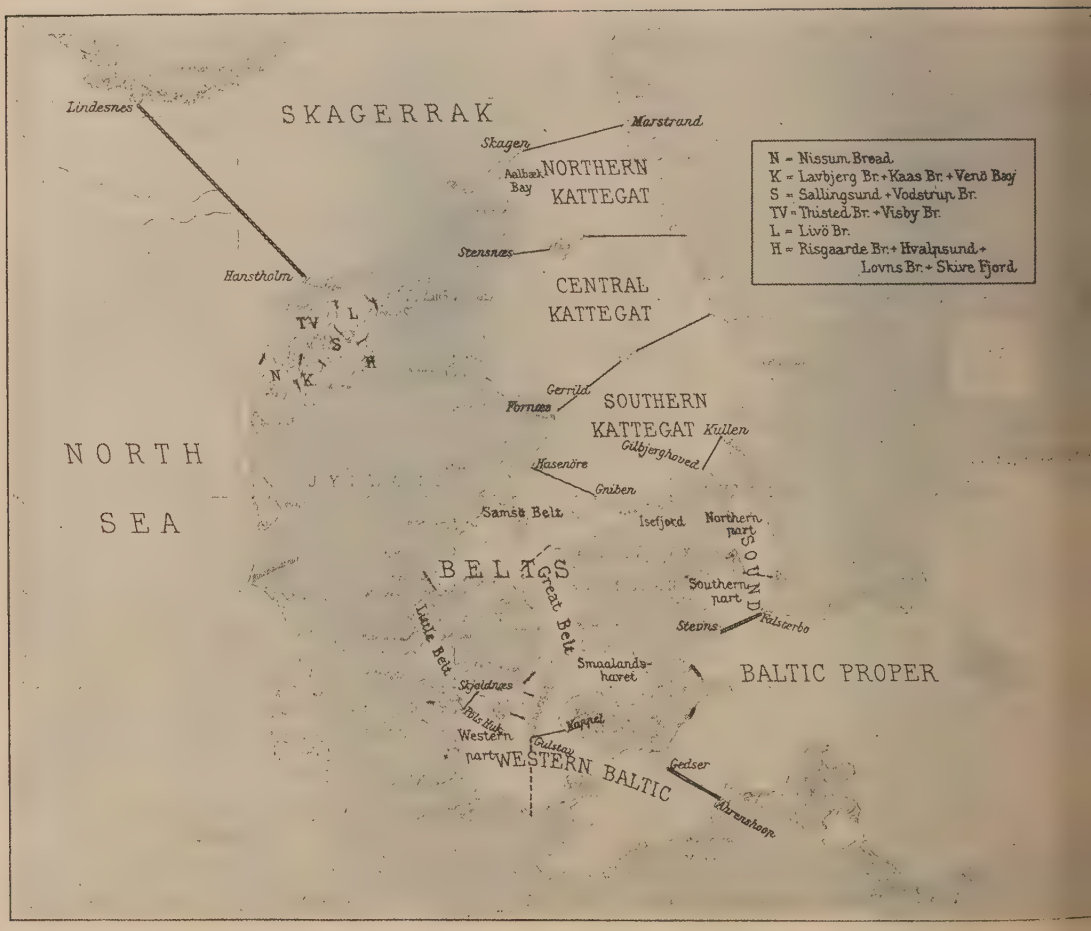
Herring. Samples of herring caught by the Swedish research vessel "Skagerak" in the North Sea and the Skagerak in the autumn and winter of 1946 and 1947 have been examined. The fact that samples from the Fladen Ground and the Skaw area show the same age composition supports, according to K. A. Andersson, the assumption that it must be the same herring in both areas though at different seasons.

The age, size, growth and racial characters of herring from various parts of the Danish waters of the Transition Area have been investigated, and tables showing the results are given in this report.

Waste-fish catches from the Skaw and Hirtshals have been examined.

Lobsters, Prawns and **Oysters.** A survey of the investigations in Norwegian and Danish waters, together with statistical data, are given.

E. M. Poulsen.



Map of the Danish Waters showing Limits between the Different Areas.

ENVIRONMENT.

Hydrography.

Table 1. Monthly Means of Salinity at Surface and Bottom at the Lightvessels "Anholt Knob" (A) and "Halskov Rev" (H), for a series of years, and Deviations from these Means.

(From the Danish Meteorological Institute, Nautical Dept.).

Lightvessel	X	XI	XII		I	II	III	IV	V	VI	VII	VIII	IX
Surface.													
Mean	20·7	21·9	22·8		23·5	23·1	20·2	19·2	18·1	18·9	19·4	20·1	20·7
„	16·2	16·3	15·6		16·8	14·8	13·4	13·9	13·0	14·3	13·9	14·4	14·6
1945	—0·4	—1·6	0·5	1946	—0·5	—0·7	—3·0	0·1	5·3	—2·6	—1·6	—0·5	—1·4
„	0·8	—2·4	2·8	„	—0·4	5·2	—0·7	—	—3·1	—	—1·6	0·3	1·1
Bottom.													
Mean	32·2	32·4	32·1		31·8	32·0	32·5	33·0	33·1	32·8	32·3	31·9	31·8
„	23·3	21·5	22·1		21·9	21·7	24·5	27·6	29·7	30·3	29·4	27·6	24·7
1945	1·0	0·4	0·7	1946	1·6	1·5	0·7	—0·7	0·1	1·1	1·0	0·6	0·9
„	1·1	—2·8	—1·4	„	—3·0	2·1	—6·0	—	—2·8	—	0·3	—3·9	2·3

Table 2. Monthly Means of Temperature at Surface and Bottom at the Lightvessels "Anholt Knob" (A) and "Halskov Rev" (H), and Deviations from these Means.

(From the Danish Meteorological Institute, Nautical Dept.).

Lightvessel	X	XI	XII		I	II	III	IV	V	VI	VII	VIII	IX
Surface.													
Mean	10·9	7·1	4·1		2·2	1·4	1·9	4·5	9·4	14·2	16·8	16·7	14·5
„	11·1	7·3	4·0		2·4	2·0	2·4	4·5	8·9	12·7	15·7	16·4	14·5
1945	1·2	1·6	0·8	1946	0·1	0·1	—1·1	0·7	1·2	—0·2	1·0	0·5	1·3
„	1·1	1·6	1·1	„	—0·1	—0·2	—1·3	—	1·6	—	2·2	0·4	0·5
Bottom.													
Mean	12·1	10·2	8·1		6·1	4·7	4·3	4·3	4·9	6·7	9·7	12·7	13·1
„	11·6	8·4	5·9		3·9	3·4	3·4	4·3	5·7	7·1	9·1	11·7	13·2
1945	0·5	2·1	0·3	1946	0·9	1·6	1·0	1·4	1·0	0·1	—1·0	—0·6	1·1
„	0·7	1·3	—0·1	„	—1·1	—0·5	—2·1	—	0·9	—	0·3	2·2	0·3

Table 3. Monthly Means of Residual Surface Currents in cm./sec. at the Lightvessel "Halskov Rev". The Current from the Baltic is stated as positive, towards the Baltic as negative.

(From the Danish Meteorological Institute, Nautical Dept.).

	X	XI	XII		I	II	III	IV	V	VI	VII	VIII	IX
1945	—36·1	1·6	8·3	1946	17·4	—14·2	1·6	8·2	28·4	—	17·6	18·8	—15·1

Helge Thomsen.

Table 4. Sea Temperatures 1 m. below the Surface at Flødevigen.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average 1919—45	3·04	1·96	2·24	4·53	9·00	12·91	16·19	16·52	14·45	11·22	7·69	5·0
Average 1946	3·4	2·8	1·4	5·0	10·8	12·9	16·8	16·6	15·3	11·3	7·8	5·2

At Flødevigen, near Arendal, the sea temperature 1 m. below the surface was relatively high in January and February, but low in March. It rose very quickly in April, and was particularly high in May. In September it was comparatively high. Apart from this it was quite normal. The salinity was high during the first half of the year, and low in the second.

Alf Dannevig.

Benthic Food.

Valuations of the sea bottom with the Petersen bottom sampler (1/10 m.²) were carried out in the broads and sounds of the western and central Limfjord in July and September 1946. In the two larger broads, Nissum Broad in the western and Livø Broad in the central Limfjord, the following weights were obtained for 1st-class plaice food (Vermes, small crustaceans, Acera, Philine, mussels excl. Corbula, Nucula and all spec. > 3 cm.), 2nd-class plaice food (Nucula, Corbula, small snails and small echinoderms) and non-plaice food animals (larger molluscs, ascidians, sea-anemones etc.). The figures below give the mean values in grammes per m.² of the autumn investigations one year, and the spring investigations the following year.

The 1st-class food is thus near the normal in Nissum Broad, and somewhat above the normal in the Livø Broad. Concerning the bottom animals, on the whole it can be stated that the increase of the stock which began in 1943 has continued; thus recovery from the very cold winters is proceeding

	1st Class		2nd Class		Non-Food	
	1945/46	Mean 1926/46	1945/46	Mean 1926/46	1945/46	Mean 1926/46
Nissum Brd.	8	9·4	24	119	158	79
Livø Brd.	32	20	23	22	780	260

In 1933 the eel-grass (*Zostera marina*) disappeared completely from the fjord owing to a disease. Up to that year eel-grass covered large areas of the fjord, but since then only very small patches have been observed, mostly in the sheltered, more brackish parts. It is of interest to note that this almost complete disappearance of the eel-grass has not been followed by any decline in the stock of eels. In fact the catches were just as high in the years 1933—39 as in former years, and lately (see p. 103) an increase in the eels caught has again taken place although large beds of eel-grass are still lacking.

Erik M. Poulsen.

THE FISH.

Eggs and Larvae.

aterial has been collected near the Norwegian erak coast, but it has not yet been worked up.

idae.

oung. The usual experimental fishing in the al region of southern Norway in September October yielded the following average numbers aul:

	Cod 0-Gr.	Cod I-Gr.[1])	Whiting 0-Gr.	Pollack 0-Gr.
erak coast				
auls				
age 25 years	*13·7*	*1·7*	*17·8*	*16·6*
1945	13·0	1·0	65·9	32·8
1946	1·8	1·1	20·9	3·6
fjord				
auls				
age 6 years	*37·9*	*3·5*	*13·3*	*5·4*
1945	92·0	1·2	34·5	16·0
1946	0·9	9·1	15·3	0·6

[1]) Including a few older fish.

n 1946 **cod** of the 0-group was very scarce; ne Skagerak coast 1/7 of normal, and in the fjord 1/40 of the average of the previous 6 s (the 1938-class, however, having been ab- ally high). The I-group was relatively dant in the Oslofjord, due to the rich brood 945. The **whiting** was more numerous than , but the **pollack** was scarce. For comparison earlier years see the report for 1945.

he experimental fishing with traps at Fløde- resulted in catches of 72 cod per trap. This uite normal and the different year-classes ed the usual relative abundance, with the oup predominating.

Alf Dannevig.

ce.

Abundance of Year-Classes.

Ann. Biol. II the figures given for the Sound, ble 1, p. 91, are for the area Gilbjerghoved— ør, excluding the area Dragør—Stevns, in to make a comparison between the figures correct. In the southernmost area, where no g experiments were carried out during 1940 942, the number of 0- and I-group plaice is ally much lower than in the northernmost

Table 5.
Number of Plaice of the 0- and I-Group.

Danish coasts (Aa. J. C. Jensen)	No. of stations	1946 No. per 30 min. haul. 0-Gr.	1946 No. per 30 min. haul. I-Gr.	Mean of 1927-46 No. per 30 min. haul. 0-Gr.	Mean of 1927-46 No. per 30 min. haul. I-Gr.
N. Kattegat	*10*	8	17	41	26
C. Kattegat	*16*	5	3	15	5
S. Kattegat	*20*	9	1	14	1
Belts	*68*	24	1	14	1
W. Baltic	*2*	5	0	7	0·2
Sound	*17*	5	0·2	10	1
Swedish coasts (A. R. Molander)				Mean of 1929-38	
Skagerak	*26*	83	5	50	9
C. Kattegat	*16*	4	7	75	14
S. Kattegat	*21*	1	21	96	8
Sound	*0*	—	—	7	0·1

The number per 30 min. haul was calculated for each station, and the means of these values are given for each area (see also Figs. 1 and 2).

For the boundaries between the different areas see the chart, p. 90.

The average figures for the whole Sound were:

	1940	1941	1942	1943	1944	1945
0-Gr.	16	7	0·0	0·4	6	5
I-Gr.	0·0	0·1	8	0·0	0·3	0·4
No. St.	11	15	10	15	20	19

The following meteorological-hydrographical factors display a considerable correlation with the strength of the year-classes. All the correlations are positive.

The strength of year-classes in	Meteorological-hydrographical factors: Western Winds in	Surface temp. in	Surface Salinity in
Northern Kattegat	Feb., March	March, April	Feb.-April
C. and S. Kattegat	Jan.-March	Jan.-April	Feb.
Belts	Jan., Feb. (March)	Jan.-Feb.	Jan., Feb.
W. Baltic	Jan.-March	Jan.-Feb.	Feb.

During January to April 1946 the frequency of the western winds was about normal in January and February, considerably below normal in March, and above normal in April.

In the Kattegat the wind conditions, the temperature and the salinity, as shown on p. 91 (Hydrography), may explain the poor year-class in these areas, while in the Belts the very high positive salinity anomaly in February may explain the comparatively good year-class there.

Aage J. C. Jensen.

Fig. 1. Number of Plaice of the 0-Group (year-class 1946) taken per fishing unit in the summer of 1946.
The fishing unit used was a 30 minutes' haul with Johansen's young plaice trawl.

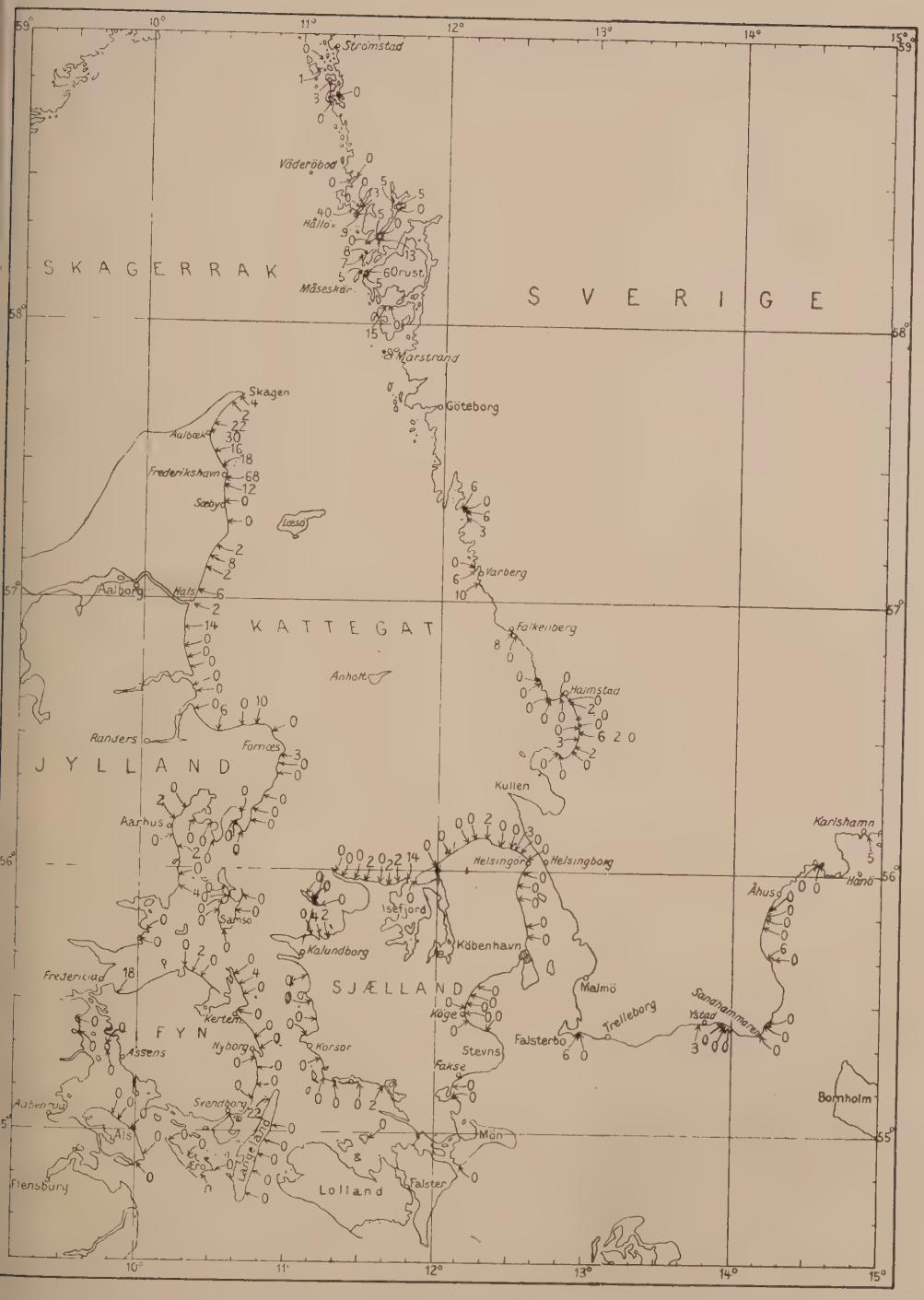


Fig. 2. Number of Plaice of the I-Group (year-class 1945) taken per fishing unit in the summer of 1946.
The fishing unit used was a 30 minutes' haul with Johansen's young plaice trawl.

Size and Age Composition of Commercial Catches of Plaice.

Representative samples taken at random from landings in the harbours of Skagen, Grenaa and Bagenkop, have been measured, and in some cases age-determinations were made.

At the Skaw the length of the plaice caught at depths of more than 15—20 m. had increased considerably since 1945, as is shown in Table 6.

The cause of the increase in length must no doubt be sought for in the fact that a stock incorporating a relatively high number of large plaice had accumulated in the mine fields, where they were protected against the fishery. The presence of these large fish has affected the catches to an increasing degree, as shown by the figures for 1946.

On the shallows of the western part *of the central Kattegat* (between Læsø and Djursland) the mean size of the plaice caught was a little less than in 1945, because the relatively good 1944 year-class began to appear in the catches here during 1946 (comp. Table 6).

In the *southern Kattegat* and the *northern part of the Belt Sea* where the growth of the plaice is somewhat more rapid, this development had started during 1945 on the shallow and coastal areas near the fishing grounds. In 1946 the stock in deeper waters had also changed, and the catches were now no longer dominated by large plaice as they had been during the war, but by the small ones (see Table 7).

A similar change in the stock had occurred throughout the Belt Sea and the western Baltic (see Table 7).

On most of the fishing grounds the stock during 1946 was characterized by the many plaice of 26—30 cm., originating from the 1944 year-class. Yet a fairly high percentage of very large plaice was found on the grounds neighbouring the southern part of Langelandsbelt, which was closed during the war because of mine fields. These large plaice were particularly noticeable on the spawning grounds during the winter months as can be seen from the catches made to the SE. of Kels Nor and S. of Langeland. The high frequency of the older year-classes in these catches is made clear by the age-analyses shown in Table 8.

It is noteworthy that the average length of each of the age-groups has not changed during the war (see Table 8).

Aage J. C. Jensen.

Abundance of Age-Groups of Plaice in the Limfjord.

(Data derived from experimental hauls.)

The following figures give the total numb of plaice caught per 30 minutes with the eel-t (a small-meshed seine) in the various parts of t fjord. Means for the years 1927—39 are given brackets.

	Nissum Broad	Venø Bay — Kaas Br.	Sallingsu Vodstrup
Summer	576(356)	15(84)	4(46)
Autumn	990(481)	15(92)	14(12)
	Livø Br.	Thisted— Visby Br.	East of Salling
Summer	2(5·5)	1·0(12)	0·6(5)
Autumn	2(2·4)	0·3(3·6)	1·0(1·1)

On the nursery grounds in the westernmost p of the fjord (Nissum Br.) the stock was very lar being about twice the normal. In the inter between the two investigations (from the end July to the middle of September) a considera increase in the stock took place showing that t immigration through the Thyborøn channel w very large in these months. The stock of 1946 w the largest found since 1930 (cf. Fig. 3 in the A Biol. II). In the inner parts of the fjord the sto was everywhere considerably below normal, t no doubt is at least partly due to the small ext of the transplantation to these waters.

The composition of the stock of plaice on t nursery grounds in Nissum Broad appears fr the following figures; the means for 1927—39 brackets:

Age-Gr.	Year-Class	Summer (July)	Autumn (Sep
0	1946	15(0)	9(40)
I	1945	165(76)	252(224)
II	1944	237(154)	455(149)
III	1943	156(103)	267(62)
IV+	1942—	3(27)	7(17)

The figures for July are not quite comparal with the means as the investigations were carri out about $1^1/_2$ months later than usual (1st h of June). The figures for the autumn show t the 1945 year-class was a little above normal. t 1944 and 1943 year-classes far above normal. a the 1946 year-class was considerably below norm

Erik M. Poulsen.

Transplantation of Plaice.

The Belt Sea and surroundi waters. Owing to the war no transplantati could be undertaken in the years 1943—45. spring 1946 transplantations were re-commenc

	N. of the Skaw			S. of the Skaw			S. and S.E. of the Østre Flak			N. of Tangen		
Year:	1943	1945	1946	1940	1945	1946	1941	1945	1946	1942	1945	1946
Month:	VI-VIII	VII	VI	V	VI	IV	VIII-IX	VIII	VII-VIII	IX	IX-X	IX-X
Depth m.	40—65	40—70	40	15—17	25—30	22	12—15	12—13	13—14	14	8—12	11—12
No. of samples:	3	1	1	1	1	1	4	2	2	1	2	3
20—25 cm.	—	—	—	27	—	—	—	—	—	—	—	—
26—30 cm.	527	161	56	940	726	253	637	598	795	556	657	775
31—35 cm.	328	629	569	27	242	481	340	391	184	444	318	187
36—40 cm.	127	210	347	5	24	240	23	11	21	—	25	38
41—45 cm.	17	—	28	—	8	26	—	—	—	—	—	—
Total	999	1000	1000	999	1000	1000	1000	1000	1000	1000	1000	1000
Mean length cm.	31·2	33·6	35·6	27·4	29·6	34·0	29·9	30·2	29·1	35·6	33·0	29·8

Table 7. Length Composition (per thousand). Southern Kattegat and Belt Sea.

	Southern Kattegat						Near the southern end of Langeland									
	E. of Fornæs			N. of Schultz's Grund			Ristingebay		7 Sm. WSW. of Bagenkop		S. of Langeland		3-4 Sm. SE. of Kels Nor		5-6 Sm. SE. of Kels Nor	
Year	1942	1943	1946	1942	1943	1946	1941[1]	1946	1941	1946	1941	1946	1941	1946	1941	1946
Month	V	IV-V	IV-VI	IV	IV	III	X	X	XI	XI	XII	XI-XII	VIII-XII	IX-XI	XII	I
Depth, m.	18	18	17-18	30	27-28	28	11	9	30	30	23-26	23	23-26	23-24	23	23
No. of samples	1	2	3	1	2	2	1	1	1	1	2	2	8	2	1	1
cm.																
26—30	0	36	413	48	154	668	140	612	66	250	356	534	261	545	364	316
31—35	211	384	469	503	448	289	710	306	793	643	492	322	527	368	477	421
36—40	648	352	110	360	357	44	150	82	141	147	152	108	206	86	136	53
41—45	141	196	8	90	40	—	—	—	—	—	—	16	6	—	22	184
46—50	—	32	—	—	—	—	—	—	—	—	—	20	—	—	—	0
51—55	—	0	—	—	—	—	—	—	—	—	—	0	—	—	—	26
Total	1000	1000	1000	1001	1001	1001	1000	1000	1000	1000	1000	1000	1000	999	999	1000
Mean length cm.	38·2	36·8	32·7	35·9	34·6	30·2	32·8	30·3	33·3	32·3	32·8	31·9	33·3	31·9	32·8	34·4

[1]) At this small depth catches in August 1941 consisted of 930 ‰ of 26—30 cm. and 70 ‰ of 31—35 cm.

Table 8. Age Composition (pr. thousand). Near the southern end of Langeland.

Position	Depth m.	Year	Month	I	II	III	IV	V	VI	VII	VIII	IX	X	Total	Mean length, cm. II-Gr.	Mean length, cm. III-Gr.
5—6 Sm. SE. of Kels Nor	23	1941	XII	22	682	273	22	—	—	—	—	—	—	999	31·8(30)	35·5(12)
	23	1946	I	105	579	132	53	—	79	26	—	—	26	1000	31·9(22)	36·1 (5)

Table 9.
Mean Number of Anal Fin Rays.

(No. of specimens in brackets).

Year-class	Coastal Waters off Thyborøn	Nissum Broad	Both Areas
1931	53·44(87)	54·36(11)	53·54(98)
1932	54·70(327)	54·68(144)	54·69(471)
1933	53·99(679)	53·65(593)	53·83(1272)
1934	54·19(684)	54·17(236)	54·19(920)
1935	54·78(63)	54·04(413)	54·14(476)
1936	53·84(1315)	53·83(748)	53·84(2063)
1937	53·76(389)	53·57(1063)	53·63(1452)
1938	53·84(984)	54·37(62)	53·89(1046)
1939	53·66(683)	53·39(77)	53·64(760)
1940	53·33(383)	53·28(249)	53·34(632)
1941	52·87(7)	53·02(413)	53·02(420)
1942	—	53·47(364)	53·47(364)
1943	—	54·41(896)	54·41(896)
1944	—	54·48(40)	54·48(40)

but on a far smaller scale than before the war owing to the danger of mines. The plaice were caught in the Nissum Broad and transported in well-smacks to the places of liberation. Only very few (about 1 %) of the fish died or were seriously damaged while being transported. The following weights and numbers were liberated:

	kg.	No. of ind.
Southern Kattegat	12,150	145,300
The Sound	8,050	98,400
Northern Belt Sea	19,550	252,100
Southern Belt Sea	19,850	236,400
Total	59,600	732,200

The mean length was 18·6 cm. (16—24 cm.) and the mean weight 81 g. per individual.

The Limfjord. In the course of April 1946 70,000 kg., or 951,600 individuals, were transplanted in well-smacks from the Nissum Broad to the inner part of the Limfjord. The transplanted plaice had a mean length of 18·5 cm. (16—24 cm.) and a mean weight of 75 g. 500 of the transplanted plaices were marked; of these only 8 % were recaptured (until January 1947). Particulars of the transplantations in the previous years (1940—45) are published in the Ann. Biol. II.

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Yearly Variations in the Number of Anal Fin Rays of the Plaice in the Thyborøn Area.

During the investigations carried out in connection with the transplantation of plaice in the Limfjord counts were made of the number of anal fin rays in young plaice (mainly II—IV Groups) caught in the coastal waters of the North Sea just off Thyborøn and in the Nissum Broad (the Limfjord just inside Thyborøn). See Table 9.

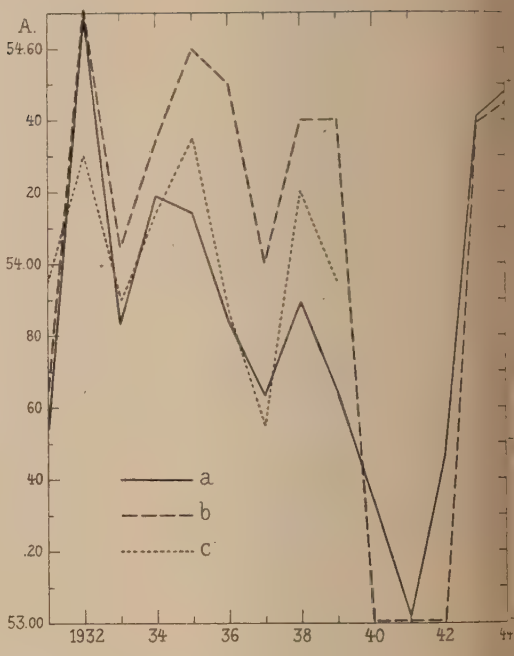

Fig. 3. Comparison between the number of anal fin rays plaice of the year-classes 1931—44 (a), and deviations fr the mean temperature of the bottom water (30 m.) in Jan March at Læsø Trindel L. V. (b), and Horns Reef L. V.

As shown by this table the number of fin ra is about the same in the two areas; the last colun gives the means for both areas. The number fin rays of the different year-classes varies co siderably, from 53·02 (1941) to 54·69 (1932). comparison between the salinity of the botto water in the eastern North Sea during spawni time (January—March) and the number of f rays of the year-classes has shown no correlatio However a considerable positive correlation found between the number of fin rays and t temperature of the bottom water from January March, i.e., the period when the development the larvae in the eggs takes place. Owing to t war no hydrographic observations were ma from Danish light vessels in the North Sea fro 1940 to 1945. Therefore the number of anal rays has been compared with the temperature the North Sea water (Horns Reef L.V.) only the years 1931—39. In order to use the data later years, when there was a low number of ra a comparison has been made with the temperatu of the bottom water at Læsø Trindel L.V. in northern Kattegat. This light vessel was not us during the severe winters of 1940—42; the te perature of the bottom water during these wint has been estimated to within 2°C.; (the me temperature of the bottom water in April 19

he first severe winter, was 1·6°C.). The fol- correlation coefficients have been calculated n the number of anal fin rays of the year- 1931—44 and the temperature at 30 m.

Rev L.V., Jan.—March 1931—39:
$+ 0{\cdot}7193 \pm 0{\cdot}161$
Trindel L.V., Jan.—March 1931—44:
$+ 0{\cdot}6437 \pm 0{\cdot}157$[1])
Trindel L.V., Jan.—March 1931—44:
$+ 0{\cdot}6949 \pm 0{\cdot}156$[2])

Temp. 1940—42 estimated.
Years 1940—42 excluded.

nilar results have been found by Aage J. nsen for the eastern North Sea and the ak.[1])

ure 3 gives a graphic picture of the correla- This correlation is positive and very high; e coefficient is about 4 times the mean error. ne months from December to March the ing coefficients were found between anal ys and the temperature of the bottom water n. at Læsø Trindel (1931—39 and 1944):

Dec.	$-0{\cdot}1124$	$\pm \varepsilon\ 0{\cdot}312$
Jan.	$+0{\cdot}0760$	$\pm \varepsilon\ 0{\cdot}315$
Feb.	$+0{\cdot}8205$	$\pm \varepsilon\ 0{\cdot}103$
March	$+0{\cdot}6662$	$\pm \varepsilon\ 0{\cdot}176$

us no correlation is found for December and y whereas a strong correlation is found for ry and March.

ere is thus hardly any doubt that the low rs of anal fin rays coincide with the low atures of the water during the period of development. It is of interest to note that Tåning[2]), by means of experiments, has that the numbers of rays in the dorsal and l fins of the sea trout increase with increase perature, while the number of anal fin rays only slight difference at the various tem- es.

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the nursery grounds in the western Limfjord is very common, although it does not occur large numbers as the plaice. As was the ith the stock of plaice (see Ann. Biol. II) ck of dab decreased rapidly since 1930 and a minimum in 1941. However, whereas the f plaice has increased considerably since specially from 1945 to 1946, only a smaller increase has occurred in the stock of dab. This will be seen from the following figures which give the mean numbers caught per 30 minutes with the eeltog during the spring and autumn investigations of 1928 to 1946:

Year:	1927	'28	'29	'30	'31	'32	'33
Number:	89	149	271	133	88	93	73
Year:	1934	'35	'36	'37	'38	'39	'40
Number:	52	104	85	31	23	35	25
Year:	1941	'42	'43	'44	'45	'46	Mean
Number:	27	75	89	58	20	50	*79*

Erik M. Poulsen.

Herring.

Spring Fishery.

The race analyses showed that all or most of the herring caught were spring spawners. In the *Nissum Broad* they were Aalborg herrings, i.e., the spring spawners of the Limfjord. The *Randers Fjord* sample consisted of a mixture of about 70 % immature young with some maturing, spawning and just spent herring, all of which were typical Kattegat spring herring, and some 30 % recovering spents; the latter were too few to be referred to race with certainty, though they may belong to some local early spring spawners or possibly to the Sound herring. (Table 10).

At *Hundested* the mature herring were of the spring spawning race of the Southern Kattegat and Belts, but the herring of maturity stages III and VIII were too few to be referred to any race.

Autumn Fishery.

In each of the two samples investigated there were about equal numbers of autumn spawners of maturity stages IV, V, VI, and VII, and of spring spawners of stages I, II, III and VIII. (Table 11).

The racial characters of the autumn spawners were such as were to be expected from the localities (southern Kattegat and Belt Sea), while the spring spawning herring had the same racial characters as the recovering spents of the Randers Fjord sample in May.

The Trawl Herring Fishery at the Skaw.

From the trawl fishery for herring at the Skaw 11 catches were analysed during the winter and spring season of 1945/46.

The lengths of these herrings ranged from 10 to 29 cm. Those with scales showing 0, 1 and 2 rings had mean lengths of 13—15, 19—20 and 20—23 cm. respectively; there were also some older fish. The age composition varied very much from sample to sample.

age J. C. Jensen: Fluctuations in the Racial rs of the Plaice and the Dab. Journ. du Conseil, 1939.

V. Tåning: Experiments on meristic and other rs in Fishes. I. Medd. Komm. Danmarks Fiskeri- nders., Ser. Fiskeri, Bd. IX, 3, 1944.

Table 10. The Spring Herring Fishery in the Limfjord and the Kattegat.

Maturity (percent).

Locality	Date	Gear	II	III	IV	V	VI	VII	VIII
Nissum Broad:	8./5.	Pound net	—	1	—	97	2	1	—
Randers Fjord:	9./5.	„ „	16	36	5	5	8	1	30
Hundested:	26./5.	„ „	—	1	1	88	2	2	7

Size Distribution (percent).

cm.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Nissum Broad:	—	—	1	—	—	9	25	35	15	8	6	2	0·4	—	—
Randers Fjord:	1	3	8	15	12	8	10	11	21	7	1	—	2	—	1
Hundested:	—	—	—	1	4	11	14	29	30	9	1	0·5	—	—	—

Racial Characters (No. of individuals in brackets).

			V. S.	V. P.	K_2
Nissum Broad:		Total:	55·65 (119)	23·62 (119)	13·96 (115)
Randers Fjord:		Mat. II, III:	55·79 (68)	23·54 (68)	13·91 (46)
		IV, V, VI, VII:	55·87 (23)	23·48 (23)	14·1 (15)
		VIII:	55·51 (39)	23·62 (39)	14·00 (36)
Hundested:	Mat.:	IV, V, VI, VII:	55·66 (111)	23·67 (111)	13·97 (108)
	„ :	III, VIII:	55·2 (9)	24·2 (9)	14·0 (8)

Age Composition (percent).

Winter Rings and Age			2	3	4	5	6	7	8	9	10	11	12	13	Total
Nissum Broad:		Total:	9	69	15	6	1	—	—	—	—	—	—	—	100
Randers Fjord:	Mat.:	II, III:	42	3	5	1	1	—	—	—	—	—	—	—	52
	„ :	IV, V, VI, VII:	11	5	1	—	—	1	—	1	—	1	—	1	21
	„ :	VIII:	5	10	5	4	1	1	—	1	—	—	—	—	27
		Total:	58	18	11	5	2	2	—	2	—	1	—	1	100
Hundested:	„ :	IV, V, VI, VII:	7	42	26	14	3	1	—	—	—	—	—	—	93
	„ :	III, VIII:	—	4	2	1	0·5	—	—	—	—	—	—	—	7
		Total:	7	46	28	15	3	1	—	—	—	—	—	—	100

The maturity was as follows:

Maturity stages	I	II	III	IV	V
Range (percent.)	30—100		0—25	0·1	0—1
Mean (percent.)	75		9	0·1	0·2

Maturity stages	VI	VII	VIII
Range (percent.)	—	0—12	0—45
Mean (percent.)	0·0	3	12

The herring in each sample which were at stages I, II and III gave average values for V.S. between 56·43 and 56·92. Inside the Skaw no race has a V.S. as high as this with the exception of the winter herring of the Kattegat (Johansen, 1923) which is closely related to the Norwegian "Vaarsild". The combination V.S. — V.P. — K_2 shows that most of these herring from the Skagerak, where the V.S. is 56·43—56·66, are summer and autumn spawning herrings of the North Sea; while in two of the samples from December and January the high number of V.S. in combination with V.P. and K_2 indicates that these herring belong to the Kattegat winter herring or another winter or spring spawning race with similar racial characters (the Norwegian spring herring from the Skagerak or the Shetland spring herring).

The number of herring of maturity VII and VIII investigated in most samples was too small to determine with full certainty to which race or races they belonged. However the combination V.S.—V.P.—K_2 seemed to indicate that every one of them belonged to the summer and autumn spawning herring of the North Sea.

e 11. The Autumn Herring Fishery in the Southern Kattegat and the Belt Sea.

Maturity (percent).

Locality	Date	Gear	I	II	III	IV	V	VI	VII	VIII
lden, Seeland	30./9.	Pound net	5	7	31	1	51	—	2	4
agenkop, Langeland	16./10.	Drift „	4	26	9	1	39	3	9	10

Size Distribution (percent).

cm.	18	19	20	21	22	23	24	25	26	27	28	29	Total
n: Mat. I-II:	1	4	3	1	2	0·5	—	—	—	—	—	—	12
„ IV, V, VII:	—	4	1	3	7	10	17	4	2	—	—	—	48
„ III, VIII:	—	—	—	—	5	8	12	10	4	—	—	—	39
Total:	1	8	4	4	14	19	29	14	6	—	—	—	99
kop, Mat. I-II:	—	7	17	4	2	—	—	1	—	—	—	—	31
„ IV, V, VI, VII:	—	—	3	13	19	10	6	—	—	—	—	—	51
„ III, VIII:	—	—	—	3	5	5	5	—	—	—	—	0·5	18
Total:	—	7	20	20	26	15	11	1	—	—	—	0·5	100
n — Djursland ing. 1937—42:	—	0·5	3	6	10	16	15	15	16	11	5	2	100

Racial Characters (No. of individuals in brackets).

	V. S.	V. P.	K_2	
n: Mat. I, II, III, VIII:	55·71 (70)	23·49 (70)	13·94 (67)	spring spawners
„ IV, V, VII:	55·78 (60)	24·13 (60)	14·50 (60)	autumn spawners
nkop: Mat. I, II, III, VIII:	55·84 (50)	23·58 (50)	14·08 (50)	spring spawners
„ IV, V, VI, VII:	56·13 (70)	24·14 (70)	14·21 (70)	autumn spawners

Age Composition (percent).

Age	1	2	3	4	5	6	7	8	Total
en-Djursland Herring 1937—42:	—	2	36	28	24	7	2	1	
Year-Class:	1945	1944	1943	1942	1941	1940			
n: Mat. I, II, III, VIII:	14	31	23	22	4	6	—	—	100
„ IV, V, VI, VII:	—	10	47	33	10	—	—	—	100
kop: Mat. I, II, III, VIII:	59	30	7	1	3	—	—	—	100
„ IV, V, VI, VII:	—	14	54	28	2	2	—	—	100

The Trawl Herring Fishery in the Limfjord.

ing 1946 four samples were examined, one January, February, November and December. gth of the herring in each of the samples ween 7 and 17 cm.; in the earlier two they ostly 11—13 cm., in the later two, 8— they were of maturity stages I and II.

The racial investigations showed that the herrings which were less than 12·0 cm. long were Thyborøn spring herring while the larger ones were Thyland autumn herring.

During the preceding years (1939—45) the small herring caught in the Limfjord had been autumn spawning herring from the North Sea. In a few of the samples (especially from 1945) they were possibly mixed a little with the Thyland autumn spawners.

Aage J. C. Jensen.

Fladen Herring at the Skaw.

I have previously discussed that the autumn-spawning herring which in August and September are caught on the Fladen Ground in the north-western part of the North Sea are also caught in the Skaw area and off the Swedish west coast during the winter. It was then suggested that a characteristic feature in this autumn-spawning herring is the small central areas on the scales.

During 1946 and at the beginning of 1947 this problem has continued to be investigated. Samples from all the following catches have been analysed with regard to the size of the central area, vertebral number, the developmental stage of the gonads and the fat content. By using the size of the central area and the maturity of the gonads it is easy to recognize the Fladen herring when it appears in the eastern part of the Skagerak.

On a cruise with the research vessel "Skagerak" to the western part of the North Sea in the latter part of September 1946 a number of hauls with the herring trawl were carried out on the Fladen Ground. A great number of Swedish motor-vessels were also fishing for herring there. The depth was 130—152 m. and the best catches were taken in areas with a bottom temperature of 6·98°—7·79° and a salinity of 34·31—34·62 ‰. When the

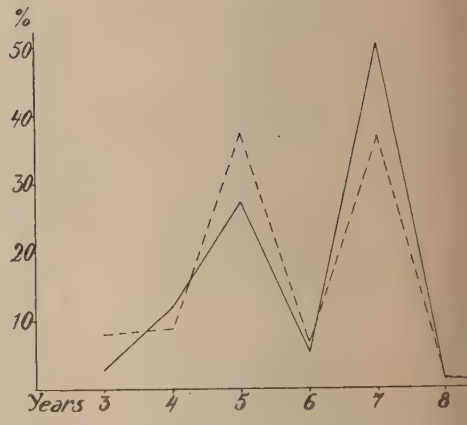


Fig. 4. Age-Composition of Herring Catches.
———— Herring from the Fladen-area, Sept.
– – – – – – „ „ „ Skaw-area, Febr.

temperature was 8·50°—9·09° C practical herring were caught. (See Table 12.)

On the return voyage fishing experiment the herring trawl were carried out in the are of the Skaw but no herring were caught. In this area is very good for herring fishing the time of these experiments the bottom te ture was too high: about 12° C.

Table 12. Fishing Experiments on the Fladen Ground and in the Skagen Ar

I. Fladen Ground in September 1946.

				Depth m.	Bottom-temp. °C	Sal. ‰	Catch
1. Sept.	18th.	57°58′ Lat. North	— 0°4′ Long. East	113	9·09	34·85	No herri
2. „	„	58°3′ „	— 0°7′ „	139	7·60	34·31	102 indi
3. „	19th.	58°6′ „	— 1°16′ „	131	7·79	34·47	100 kg.
4. „	20th.	58°31′ „	— 0°3′ „	145	6·98	34·43	25 „
5. „	„	58°16 „	— 0°37′ „	152	7·05	34·62	100 „
6. „	21st.	57°49′ „	— 0°52′ „	130	8·50	34·50	46 indi

In all these cases the weather was very rough and the trawl used was not very effective.

II. The Skagen Area in Sept. 1946.

7. Sept.	25th.	57°58′ Lat. North	— 9°46′ Long. East	95	12·01	34·18	No herri
8. „	„	58°1 „	— 9°42·5′ „	151	7·62	34·58	11 indiv

In the experiment 7 and 8 the same trawl was used.

III. The Skagen Area in Febr. 1947.

9. Febr.	3rd.	57°49′ Lat. North	— 10°22′ Long. East	82	6·60	34·90	150 kg.
10. „	6th.	57°53′ „	— 9°52′ „	56	7·12	34·16	1250 „

In these two cases a more effective trawl was used.

All the hauls lasted one hour. In the beginning of February the herring from the Fladen area obviously concentrated to the rather shallow water to the west from the Skagen.

ater, on October 17th, a trawl-haul in the same was undertaken at 75 metres depth, bottom erature 7·91° C. The catch was good, but no len herring were present.

However, on February 3rd and 6th two trawl- ls in the same area were carried out success- y at depths of 82 m. and 56 m. and bottom peratures of 6·60° C. and 7·12° C. respectively. On the former ground the Fladen herring pre- inated comprising up to 74 % of the catch; in latter ground the catch consisted exclusively of den herring.

Age analyses have been made of all the herring hes taken on the Fladen Ground in September 6; the results were compared with the age-com- ition of the herring taken west of the Skaw on ruary 3rd and 6th 1947. As shown in Fig. 4 two age-curves are very similar. The year- sses from 1939 and 1941 predominate strongly the 1940 year-class is very poor in both as. Samples of the commercial catches taken January 29th and February 14th 1947 in the a west of the Skaw also show the same age- nposition.

The fact that herring from the Fladen Ground ght in September 1946 and herring taken in the aw area early in 1947 show the same age-compo- on seems to me to support the assumption that nust be the same herring in both waters though sent at different seasons of the year.

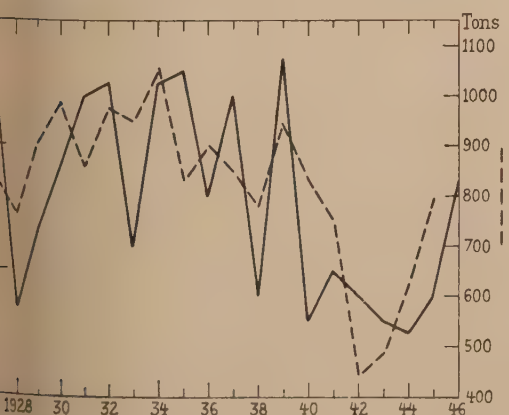
K. A. Andersson.

l.

Fishing Experiments and Commercial Fishery in the Limfjord.

The marked decrease in the stock of eels during years 1940 to 1944 has now been reduced to a certain degree, the commercial catch has risen somewhat in the years 1944 and 1945, and the yield in the experimental fishery with the eel-tog has increased in the years 1945 and 1946. As is seen from Figure 5 there is a fairly good correlation between the commercial catch and the catch in the experimental fishery; the correlation coefficient is $+ 0{\cdot}610 \pm 0{\cdot}143$. It is further seen from the figure that the catches of both the experimental and the commercial fishery were high until 1939 and that they declined very much in the years 1940—1943, i.e., during, and just after the severe winters of 1940 to 1942. There is hardly any doubt that the decline in the stock during the years 1940—1943 was caused by the severe winters, the more so, as an increase has occurred again in the years 1944—1946.

Erik M. Poulsen.



5. No. of eels caught per 30 min. in the eel-tog by the erimental fishery and the yield in tons of the commercial fishery for eels in the Limfjord, 1927—46.

Fish for Processing.

The Danish fishery for the fish-meal factories and food for the fish ponds (in Ann. Biol. II termed "waste fish") has been continued, especially in the Skagerak and the northernmost Kattegat.

This fishery is partly a special one for small whiting and other species, which can be caught in great quantities but cannot be used as human food. Partly it consists of waste fish from the trawl fishery for herring, sprat and Norwegian shrimp; and to a minor degree also from the pound-net fishery (and other fisheries).

The catch in the various waters was as follows (in mill. kg.):

	Skage-rak	Katte-gat	Belt Sea	Sound	Lim-fjord	Total
1945	8·7	9·9	1·1	0·05	1·2	21·0
1946	4·5	4·9	0·3	0·01	0·8	10·5

The total catch in 1945 was almost as great as in the peak year 1943, when the fishery reached 23 million kg.

The decline of the fishery in 1946 was essentially due to the fact that it was limited by the following restrictions (not in force in the Limfjord) aimed at the protection of the young herring:

The otter seine for sprat is allowed during the day time, from 1st Oct. to 15th April only.

Use of this gear is forbidden in fjords, bays where the mouth is less than 30 km. wide and in small sounds (exceptions may be found).

The minimum size of the mesh is to be 13 mm. from knot to knot.

The weight should be fastened by strops in order to prevent the foot rope from touching the bottom.

The head-rope must not be more than 19 m.

The net must not be drawn between two boats.

Catches containing more than 50 % small herring (or more than 45 specimens per kg.) must not be landed.

From the Skagerak 19 samples were investigated during 1946. The following species were found, and their relative abundance, by weight, is given:

Species	%
Whiting	43
Norway pout	14
Poor cod	10
Haddock	4
Flatfishes	1·2
Cod	0·5
Herring	1·5
Sprat	0·2
Mackerel	0·2
Other fish and intervebrates	25

The outstanding difference between the composition of the catch in 1946 and those in former years (see Ann. Biol. II) is due to the above-mentioned restrictions.

Aage J. C. Jensen.

Marketable Crustaceans.

The yield of the Danish **lobster** (*Homarus vulgaris*) fishery, which was high in the years 1930—39, reached a maximum of 170 tons in 1937, but fell rapidly to 160 tons in 1938, 134 tons in 1939 and 87 tons in 1940, reaching a minimum of 68 tons in 1941. Since then a smaller increase has taken place to 95 tons in 1945. As both the Norwegian and Swedish fisheries have declined during the same period there is a reason to suppose tha cause may be found, at any rate partly, i environment and presumably in the extremely winters of 1940 to 1942. However, as a d also took place from 1938—39 other factors also have been at work, and here, obviously question of overfishing must be considered.

Erik M. Poul

The statistics collected from 27 fishermen the Norwegian Skagerak coast gave a total nu of 11,707 lobsters, against 11,066 in 1945. A l number of traps were used in 1946, givin average catch per trap of 6·65, as against 7· 1945.

As in earlier years the catches per trap far greater in the eastern than in the centra western districts, the numbers being 15·9, 7· 4·0 respectively.

Alf Danne

Oysters. The oysters in the natural ponds thrived. In some places, however, a high mor occurred in August. It is likely that this was c by too much fresh water in the ponds due t heavy rainfall that occurred at that time.

The collecting of oyster-spat yielded results, both in the natural ponds and in the at Fløde vigen. Apparently there was too much and cloudy weather during the summer.

Rearing experiments in the laboratory wi dealt with in a separate report (see Jour Conseil Vol. XV, 1).

Alf Danne

Baltic Area.

INTRODUCTION.

Contributions to this report have been received om Denmark, Poland and Sweden. In these pa- rs the most important food fishes as well as the vironmental conditions have been covered.

Dr. Aage J. C. Jensen, Dr. A. Glowin- a and Dr. H. Alander have given reviews the hydrographical conditions in the different rts of the area. They have found great alter- ions in the temperature, salinity and oxygen con- nt which have an important bearing on the stocks fish.

Dr. F. Chrzan and Dr. Alander deal ith the cod and the cod fishery. The cod was very undant in the southern Baltic and the catches ere extremely large. Alander states that the ain part of the stock belongs to the year-classes f 1941, 1942 and 1943, these year-classes being ery rich. In his opinion, this fact may be ex- lained by the very high salinity of the water uring these years.

Dr. Aage J. C. Jensen and Dr. Arvid R. Molander report on their catches of 0- and I-groups of plaice, flounder and turbot, and Dr. Z. Mulicki deals with the size and age composition of the catches of the flounder in the Gulf of Gdansk. He proves that the percentage of older flounder has increased during the war.

Dr. Aage J. C. Jensen reports on the herring investigations. The herring caught at Bornholm in the autumn of 1946 were lean, which, in his opinion, corresponds to the fact that the fat content in the plankton was low. This interesting fact, he says, may possibly be explained by the low temperature of the water.

Dr. K. Demel proves that the garfish (*Belone acus* Risso) spawns along the Polish coast.

Dr. Anna Rumek and Dr. W. Mankowski report on the plankton in the Gulf of Gdansk.

K. A. Andersson.

ENVIRONMENT.

Hydrography.

Hydrography at Bornholm.

Surface Temperature at Christiansø, N. of Bornholm.

(From The Danish Meteorological Institute, Nautical Department).

Year	Oct.	Nov.	Dec.		
1945:	13·0	9·8	6·6		
Mean 1931—44:	11·1	8·1	5·5		
Year	Jan.	Feb.	Mar.	Apr.	May
1946:	4·0	2·5	1·3	3·2	6·4
Mean 1932—45:	3·3	2·1	1·8	3·0	6·1
Year	June	July	Aug.	Sept.	
1946:	10·8	16·8	16·2	14·6	
Mean 1932—45:	11·0	15·2	16·2	14·1	

Hydrographical observations from the Danish Biological Station on September 19th about SE. of Christiansø showed a somewhat low perature at 45 m.: 4·2°C., almost as low 1941 when it was a result of the low tempe of the previous cold winter. After a mild v as that of 1945/46, the mixing of the water during the spring and summer months will nor raise the temperature in a depth of 35—45 about 6°C (as in 1939 and 1943, comp. F Ann. Biol. II p. 153). The low temperature in Sept. 1946 thus seems to indicate a mixing of the water masses during this year. may possibly be the cause of the rather bad tions of the plankton production in 1946 wh indicated by the large number of lean h caught at Bornholm during the late summe autumn.

The oxygen content at 80 m. was 1·12 cc litre, showing that the bottom water had stagnant for a longer time (more or less 1½

Helge Thomsen and *Aage J. C. Jen*

Hydrographic Observations in the Baltic during 1945 and 1946.

In Vol. II of this publication I have given a survey of hydrographic observations in the Baltic and Bothnian Seas during 1937—1944, mainly derived from the investigations carried out by the research vessel "Eystrasalt". During 1945 the "Eystrasalt" was only in action for rather a short period in the autumn in the southern Baltic, whereas in 1946 the vessel was in service from April 1st until November 1st. During this period fairly comprehensive hydrographic observations were made in various parts of the investigation area. In the following the most important results of these observations are reviewed.

During 1939—1943 the salinity was remarkably high in the southern Baltic. In the deep water off Bornholm the salter water layers had greater strength, water with a salinity of 16 $^0/_{00}$ being met with already at a depth of about 70 m. In 1943 water with a salinity of 17 $^0/_{00}$ was found depth of about 75 m. During 1944 these salt strata contracted, so that water possessing a s of 16 $^0/_{00}$ could not be obtained until a de nearly 100 m. had been reached. At the same however, the salinity of the upper water increased. This was evidently due to an inc salinity in the inner parts of the Baltic whic influenced the outflowing surface water. Bornholm area in 1944, water with a salin 8 $^0/_{00}$ was found to exist at a depth of only

During 1945 and 1946 no very great c in salinity appear to have taken place in the parts of the Bornholm basin, only a slight in in the salinity having been found. Thus the s at the beginning of April was 13·41 $^0/_{00}$ at depth, whereas nearly two months later wate a salinity of 14·76 $^0/_{00}$ could already be obtai

0 m. depth. On the other hand, in 1946, a certain decrease in the salinity was observed at the surface, the water with a salinity of 8 ‰ not being found above a depth somewhat exceeding 30 m.

With regard to the temperature conditions, the unusually high temperature of the water in the autumn of 1944 deserves to be mentioned. At 70 m. the temperature of the water was 10·42° C as compared with the normal 4—5° C. The overlying water strata exhibited no particular deviations from the normal temperature figures. In the autumn of 1945 too, the temperature was unusually high in the deeper water, being 11·22° C at 60 m. In 1946, on the other hand, no unusual water temperatures were observed.

In the central Baltic, between Gotland and the mainland, the salinity was quite low in 1938 and the boundaries between different water layers were nearly indistinguishable. In 1939—1940 a powerful inflow of large quantities of salter water evidently began. This resulted in water with a salinity of 10 ‰ being found at about 70 m. in 1942—1943, compared with 115 m. in 1938. At the same time the stratification became more marked. According to the evidence provided by the 1946 observations, the salinity distribution did not alter very much during the period when no observations were made. The temperature, on the other hand, continued to rise after the "cold period" of 1940—1942, and was remarkably high in 1946, namely nearly 9° C. at 50 m.

In conjunction with the more pronounced stratification of the water, the normally very bad circulation in the central Baltic became still worse. Usually the deep water in this area contains 1—2 cc. of oxygen per litre, but in 1946 the oxygen content of the water at a depth of 100 m. off Visby was 0·5—0·6 cc. per litre. Such a low oxygen content must undoubtedly have a considerable effect on the animal life in the deeper parts of the central Baltic.

In the Bothnian Sea several interesting observations were made in 1946. The first hydrographic observations were carried out early in May, when the temperature was still very low and fairly similar from the surface down to the bottom. East of Finngrunden, however, a water layer was found at 95 m. that had evidently not shared in the general cooling during the winter and spring. At 95 m. the temperature was 3·03° C., while the temperature of the water from 70 m. to the surface remained at about 1° C. and less. Off Agö the salinity in the spring was about 6 ‰. In the middle of September the salinity at the surface was 5·54 ‰, while at 50 m. it was 6·29 ‰. Compared with the low salinity values of 1944, an increase approximating to the level of 1942—1943 had taken place.

Bornholm Area.

20. Oct., 1945.

Depth m.	°C	S‰
0	12·62	7·72
10	12·61	7·83
20	12·58	7·88
30	8·88	8·80
60	11·22	12·23

6. April, 1946.

Depth m.	°C	S‰
0	2·20	7·45
10	2·15	7·45
20	2·11	7·44
30	1·80	7·68
50	1.83	7·83
80	5·00	13·41

Central Baltic.

21. Oct., 1946.

Depth m.	°C	S‰
0	10·53	7·72
10	10·52	7·76
20	10·50	7·76
30	10·35	7·79
50	4·61	8·83
70	4·87	14·65
100	5·41	14·96

14. Oct., 1946.

Depth m.	°C	S‰
0	9·83	7·14
10	9·87	7·09
20	9·86	7·12
30	9·68	7·26
50	8·83	7·34
70	3·80	9·20

Bothnian Sea.

East of Finngrunden, 10. May, 1946.

Depth m.	°C	S‰
0	1·04	5·90
10	1·00	5·96
20	1·00	5·96
30	1·01	5·96
50	1·00	6·07
70	0·69	6·19
95	3·03	6·83

Off Agö. 17. May, 1946.

Depth m.	°C	S‰
0	1·99	5·90
10	1·93	5·88
20	1·91	5·88
30	1·88	5·99
50	1·75	5·99
60	0·64	5·93
70	0·60	5·90

Off Agö. 20. May, 1946.

Depth m.	°C	S‰
0	4·04	5·48
10	3·75	5·50
20	2·45	5·75
30	2·10	5·95
50	1·96	6·02

Off Agö. 17. September, 1946.

Depth m.	°C	S‰
0	13·10	5·54
10	12·81	5·53
20	5·32	5·93
30	2·70	6·19
50	1·92	6·29
67	1·96	6·37

Harald Alander.

Hydrography off the Polish Coast.

Hydrographical observations have been commenced in June 1946 on 3 fixed stations in the Bay of Puck (Z_1, Z_2, Z_3) and 2 stations in the Deep of Gdansk (G_1, G_2). The investigations consisted of measurements of temperature and of determinations of salinity and oxygen content.

Compared with the average monthly temperature observed during the 10-year-period 1926—1935 (D e m e l, 1938) the surface water temperature in the Bay of Puck, during the period in question, can be considered as normal.

Surface Temperatures in °C.

	VI	VII	VIII	IX	X	XI	XII
Mean 1926—35	12·9	17·2	17·8	15·5	11·7	8·2	4·6
1946	16·5	18·6	18·3	17·1	12·9	7·0	3·8

The data concerning temperature, salinity and oxygen content in % of saturation (by volume) at station G_2 in the Deep of Gdansk are as follows:

Month	Depth in m.	T	S‰	‰O_2
VI	0	14·0	7·15	105·40
	10	11·8	7·36	103·69
	20	10·5	7·36	103·08
	30	5·4	7·45	100·68
	40	3·3	7·18	95·18
	50	2·9	7·27	90·53
	60	3·7	9·06	49·58
	70	4·5	10·15	31·54
	80	4·9	10·55	37·00
	90	4·3	11·08	54·87
	100	4·8	11·52	41·68
VII	0	16·8	6·96	102·58
	10	16·3	7·03	100·07
	20	14·1	7·31	99·05
	30	4·3	7·44	96·65
	40	3·2	7·46	95·00
	50	3·0	7·50	92·36
	60	3·2	8·28	72·25
	70	4·5	10·22	43·60
	80	5·1	10·76	28·83
	90	4·8	11·42	43·78
	100	4·9	11·68	27·02
	105	5·0	12·36	26·66

Month	Depth in m.	T	S‰	‰
VIII	0	18·5	7·28	10
	10	17·6	7·25	10
	20	17·4	7·29	
	30	17·2	7·27	9
	40	15·2	7·30	9
	50	5·0	7·42	9
	60	3·0	7·38	9
	70	3·0	7·51	9
	80	2·7	7·57	9
	90	5·0	10·88	3
	100	4·7	11·09	2
X	0	12·1	7·18	9
	10	12·1	6·96	9
	20	11·9	7·20	9
	30	11·9	7·05	9
	40	3·6	7·43	9
	50	3·7	7·67	7
	60	3·9	8·98	5
	70	4·1	9·45	4
	80	4·1	9·94	3
	90	4·4	10·64	3
	100	4·4	11·02	3

Apart from the observations at the 5 fixed t tions, during July 15th and 16th, observations v made at some other stations in the Deep of Gd and its neighbourhood. In Figs. 2 and 3 the de temperature and salinity profiles are shown. T curves have been obtained by interpolation. F the last figures it can be seen that the isohaline that time bowed towards the north.

All the data concerning temperature and sali in the Gulf of Gdansk will be published in *Bulletin Hydrographique pour les années 194 1946.*

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D e m e l, K. Température des eaux côtières polonaises Baltique, VI. Archives d'Hydrobiologie et d'Ichtyol Vol. XI, 1938.

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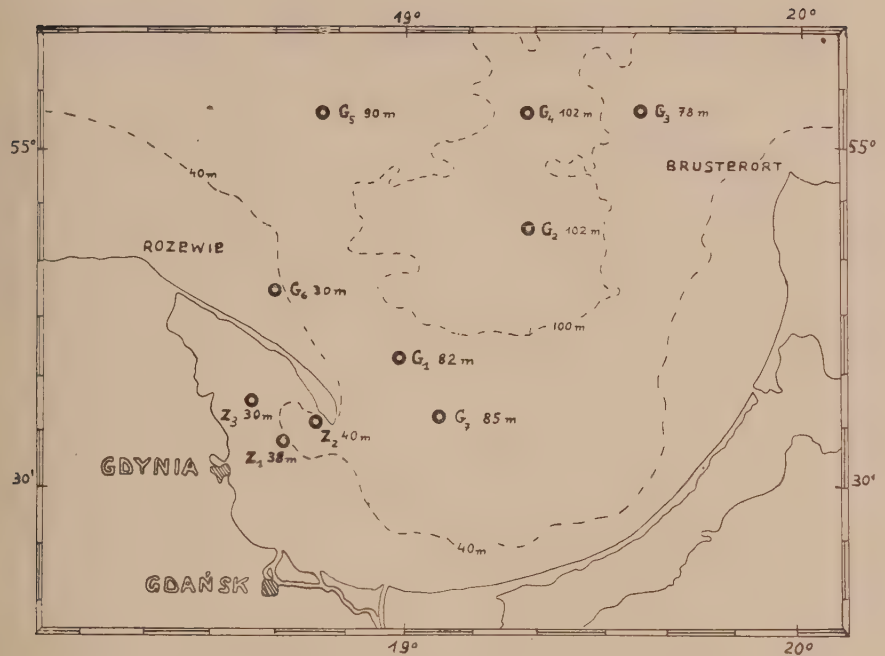
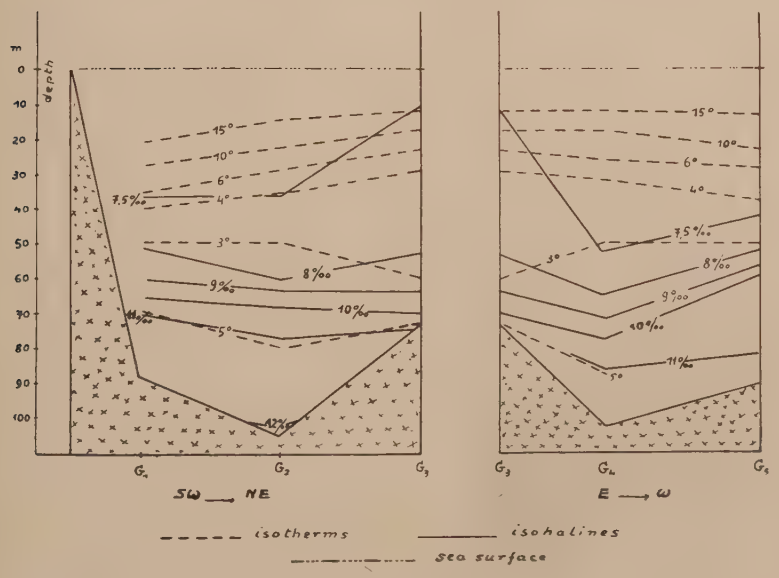


Fig. 1. Position and depth of the hydrographical stations.



Hydrographical Sections.

Figure 2. Figure 3.

Plankton.

Macroplankton Investigations in the Gulf of Gdansk in June—July 1946.

On the basis of plankton investigations carried out during June and July 1946 in the Gulf of Gdansk the following results can be recorded.

The eggs and larvae of the sprat (*Clupea sprattus* L.) in 1946 were fairly abundant. The maximum amounted to 246 eggs and 83 larvae below 1 m.^{2} of the surface.

The eggs and larvae of the cod (*Gadus morrhua* L.) were also abundant, the maximum being 262 eggs and 47 larvae below 1 m.^{2} of the surface.

The eggs and larvae of *Onos cimbrius* L. were found in smaller numbers, with a maximum of 96 eggs and 3 larvae below 1 m.^{2} of the surface.

In comparison with the occurrence of eggs and larvae of these three species in 1938, the numbers of eggs and larvae of sprat and cod in 1946 were greater. The maximum number of eggs and larvae below 1 m.^{2} of the surface in 1938 amounted to 4 eggs for sprat and 54 eggs and 4 larvae for cod.

In contrast to this, eggs and larvae of *Onos cimbrius* were more abundant in 1938, with a maximum of 116 eggs below 1 m.^{2} of the surface.

In addition, the larvae of the following species were caught: 1) *Gadus merlangus* L., 2) *Pleuronectes flesus* L., 3) *Rhombus sp.*, 4) *Gobius sp.* and 5) *Ammodytes sp.*.

The numbers of Invertebrates in the macroplankton were very small, they included:

1) *Aurelia aurita* L., 2) *Pleurobrachia pileus* O. Müller, 3) *Limnocalanus grimaldi* de Guerne, 4) *Mysidacea*, 5) *Sagitta elegans f. baltica* Ritter-Zahony.

A considerable change was noticeable in the species found in the deepest water layers of the Gulf of Gdansk. In 1946 *Cyanea capillata* L. and *Halitholus cirratus* Hartlaub were absent and very small numbers of *Sagitta elegans f. baltica*, were found, although these species were quite numerous in 1938.

The abundance of these three species in 1938 is probably connected with the strong western current of water of higher salinity (13·51 $^0/_{00}$), which entered the Deep of Gdansk at that time.

W. Mankowski.

Phytoplankton Investigations in the of Gdansk.

Phytoplankton samples collected from Feb to December 1946 in the area of the Gulf of G have been worked out qualitatively.

The phytoplankton samples examined cont some typical plankton forms together with epiphytes and bottom species. The follo classes are represented in the investigated mat

	Number of Species
Schizophyceae	45
Chrysophyceae	2
Chlorophyceae	68
Conjugatae	6
Heterocontae	3
Coccosphaerales	1
Silicoflagellatae	1
Coccolithophorales	1
Dinoflagellatae	15
Bacilariophytae	140

The identified species belong to three ec cal groups:

	Number of Species	%
1) Freshwater species	121	4
2) Brackish water species	106	3
3) Marine species	55	1

Among the species determined the follo ones seem to have been found in the Baltic fo first time:

Coccosphaera atlantica Ostenfeld (Coccosph les),

Discosphaera tubifer (Murr. et Blackmann) Os (Coccolithophorales),

Hexasterias problematica Cleve (Chlorophyc

Anna Rum

THE FISH SPECIES.

od.

Polish Investigations.

The Polish cod fishery in 1946 was very undant in comparison with pre-war times. The eld, calculated per 1 cutter per year, was about times greater than in the pre-war period.

The market measurements of the cod landed in lynia show that the majority had a body length 36—45 cm.:

body length	%
< 36 cm.	23
36—45 cm.	60
> 45 cm.	17

The spawning season of the cod in 1946, in the ılf of Gdansk, lasted till September, although ıgle individuals with ripe gonads were also served in October, and even in November.

F. Chrzan.

wedish Trawling in the Southern Baltic.

As is well known, trawl fishing in the southern ltic is of comparatively recent date. It is now ther more than 25 years since trawl fishing for aice began, after investigations made by Swedish arine biologists had shown that there was a rich ck of this species of fish in the Bornholm basin. It was found, however, that this stock very soon gan to decrease, and when trawling had been rried on for about 10 years the plaice began to so rare that, to make the fishing profitable at , other species of fish, which had previously en thrown overboard, also had to be utilized. In first place the common dab and the flounder re utilized, but the stocks of these gradually came sparser, and during the latter part of the 30s it was the cod that became mainly respon- le for the remunerativeness of the trawl fishing. It was not only fishermen from the southern ltic who took part in this fishing from Sweden; ere were also about ten trawlers from the Gothen- rg archipelago that secured large catches of cod ring the later 1930s. When war broke out and ge parts of the fishing grounds off the west ast of Sweden were blockaded, an increasing mber of west coast fishermen transferred to the ltic. At first they trawled mainly for cod, but 1942 they discovered that it was also possible trawl for herring in the deep waters off Born- lm. Gradually more and more trawlers began to fish chiefly with the herring- and sprat-trawls instead of with the larger meshed fish-trawls. Nevertheless very large quantities of cod were taken, primarily owing to the fact that the bulk of the cod stock consisted of small fish.

Judging from all appearances, the replenishment of the cod stock had been extremely good, but the enormous masses of small cod that were caught caused considerable anxiety in some quarters that before long the cod would be as rare as the plaice in the southern Baltic. It is naturally difficult to obtain exact statistics on the amounts of cod that were actually caught during the last years of the war, especially as no data concerning the German fishing have been available. The catches of Swedish trawlers in the southern Baltic in 1942 amounted to 2·7 mill. kg., in 1943 to 6·5 mill. kg. and in 1944 to 4·6 mill. kg.

It is difficult from these figures to give an idea of the extent of the reduction of the stock, as the composition of the catches naturally varied with the seasons, the fishing grounds and with the gear used. In some cases I had, however, an opportunity, by weighing and counting the catches, of forming a fairly reliable impression of their composition. On the whole, the differences between the catches of the various boats were not very great.

During 1944, as during the two preceding years, cod under three years of age dominated the catches. The older year-classes were fairly evenly represented and there was a comparative abundance of cod of eight years old and over. During 1945—1947 the youngest year-classes have been in rather short supply, while the 3—5-year-olds have been the source of a very abundant fishing.

The cod caught in the trawls varied in weight from 5 or 10 g. to about 4—5 kg., but as the catches chiefly consisted of very small cod, the mean weight was as low as about 120 g. In the catches made with fish trawls, the mean weight rose to about 200—225 g. and in those made with sprat trawls, the mean weight was as low as about 80—90 g. The mean weight of the cod captured in herring trawls was about 120—130 g. To get 1 kg. of cod the fishermen thus had to capture at least 4 or 5 fish. In the sprat trawls that were frequently used, they had to catch as many as 10 to 12 fish to get 1 kg. of cod. As a rule, one may assume, the landing of 1 kg. of cod meant the capture of 7 or 8 fish. If one assumes that about 3—6 million kg. of cod were taken annually, this means that about 20—40 million cod were caught by Swedish trawlers alone in the southern Baltic. It

should be noted that the measurements given here refer to the gross takings, which often contained large numbers of 0-group cod of 7 to 12 cm. long. These small cod were not included in the catches marketed, even though the food shortage caused a ready demand for small fish. At all events, the number of cod caught is likely to exceed the figures given above, which are probably considerably lower than the actual ones. If the catches made by fishermen from other nations are added, the figure must naturally be increased a good deal. Especially in the German herring fishing with twin trawls, very large quantities of small cod are likely to have been taken. It seems quite probable that 30—60 million cod were caught annually in the southern Baltic. This would mean that the number of cod taken would be about twice as large as in the Lofoten fishery. This comparison naturally does not apply to the weight of the catches, in which respect of course, the Baltic cannot compete.

One would naturally expect such a severe depletion of the younger year-classes to be markedly felt by the stock. However, that does not appear to have been so. An analysis of some catches in the spring of 1947 showed that the bulk of the cod comprised fish of the 1941—1944 year-classes, the 1942 year-class being the strongest, as will be seen in the table below.

Year-class	1939	1940	1941	1942	1943	1944	1945	1946
%	1	2	12	31	20	13	11	10

From the evidence provided by the fishing in the deep water off Bornholm during the spring of 1947 the supply of cod was more abundant than ever before, but owing to the limited marketing possibilities, it was impossible to take advantage of the large catches made. As the bulk of the cod taken was less than 50 cm. in length and only cod exceeding this length is marketable in Sweden, a large proportion of the catch had to be thrown overboard. In spite of this, trawlers were able to catch all they could carry with only a very few hauls. Daily catches of 10 tons of large cod were not uncommon.

The recruitment of the cod stock thus seems to have been unusually vigorous during 1941—1944. What can be the reasons for this? Judging from all appearances, it can be related to the increased salinity in the Baltic during these years. In an earlier paper (Ann. Biol. No. II) I reported that the salinity in the Baltic was higher than normal during 1940—1944. Already in 1936—1937 there was a temporary increase in the salinity, followed, after a decrease in 1938—1939, by a new and longer period of high salinity, culminating in 1942 in more than 18 ‰ in the deep water off Bornholm. During 1944 the salinity rapidly decreased to a little over 12 ‰. For two years the salinity remained low, but in 1947 it has a risen to over 18 ‰.

Now one can assume the effects of the salinity to be of two kinds. On the one hand increased supply of salter water from the Katt can carry with it a more abundant supply of and fry, while, on the other hand, the increa salinity can result in improved conditions for hatching and development of the fry in the Ba It is probably incontrovertible that there really been a certain increase in the immigration of from the Kattegat. This is shown, *inter alia*, the fact that the interspersion of whiting in catches in the southern Baltic has been c considerable during recent years. However, if immigration of cod from outside was the r reason for the enormous recruitment, the distribution in the catches should be diffe from what is is now. The annual increase salinity may not by itself be taken as a gaug the intensity of the influx. Now during the it has not been possible to keep up the hydrogra cal investigations to the level desirable, and co quently it has been difficult to obtain any e particulars on this point. In the absence of r reliable information one can, however, ass that the increase in salinity has been due to increased inflow from the Kattegat. The maxi influx should then have taken place during ––1941. In 1942, when the salinity reached maximum, the inflow should have decrea Otherwise the salinity should have increased 1943 too, as the chief "pumping-in" of salt w occurs in the autumn and winter. If the reple ment of the cod stock were, then, mainly du immigration, the strongest year-classes sh derive from 1940—1941.

Other facts also serve to prove that it is proved conditions for hatching that have prima caused the strong augmentation of the stock of Everywhere in the Baltic the stock of cod increased enormously during the years in w the salinity was above normal. Although it not been possible by trawling to get hold of youngest year-classes, except in the soutl Baltic, right up in the Bothnian Sea there undoubtedly been a good supply of small During 1941—1943 cases were often reporte fishermen getting young cod in their nets w out herring fishing. Judging from particu regarding size, these were one-year-old cod, as also the case with the specimens that I had opportunity of examining more closely. An in gration of one-year-old cod from the Kattega the southern Baltic to the Bothnian Sea se quite unlikely.

The increase in salinity has probably mad easier for the cod eggs to float in the water ins of sinking to the bottom, as is often the case in Baltic. It is not out of the question that the

can hatch out even when resting on the bottom, atching is likely to be considerably facilit- if, as is usual, they are freely suspended in ater. There will be better chances for the val of the fry too, if hatching takes place the bottom. It is then easier for them to the upper water strata and there procure the sary food for their development. This latter nstance will be worth consideration. It is not ely that a rise of some ten metres or so in ater layer where the fry hatch, gives the fry access to suitable food during the critical d when the yolk-sac has been used up and the n for food begins.

H. Alander.

Fish.

Table 1.

uber of 0- and I-Group Plaice near the Baltic s of Seeland and Møen, caught per 30 minutes with the Johansen Young-Plaice Trawl.

ear	No. of Stat.	0-Gr.	I-Gr.
946	3	4	0
of 1927—46 (18 years)		3	1

ne fishing experiments were carried out as in a depth of 1—1½ m. Fishing was not d out on the east coast of Falster, and the er of stations was small due to bad weather ions (see charts Figs. 1 and 2, pp. 94 and 95).

Table 2.

ber of the 0-Group of Plaice, Flounder and t at Bornholm, caught per 30 minutes with the Hand Push Net.

ar	No. of Stat.	Plaice	Flounder	Turbot
46	14	5	89	13
of 1932—45 ars)		8	133	17

Aage J. C. Jensen.

Table 3.

ber of 0- and I-Group Plaice, Flounder and t on the Baltic Coasts of Sweden, caught per inutes with the Johansen Young-Plaice Trawl.

Plaice	No. of Stat.	1947		Mean of 1929-38	
		0-Gr.	I-Gr.	0-Gr.	I-Gr.
st of Scania	9	3	1	37	7
st of Scania	6	3	1	2	6
st of Blekinge	3	2	2	0·2	0·3
Flounder				Turbot	
t of Scania	9	9	2	1946, whole coast	
t of Scania	6	52	1	0-Gr.	I Gr.
t of Blekinge	3	273	3	2	0

The Sandhammeren is included in the south coast of Scania. The catch of plaice at each station has been shown in Figs. 1 and 2, pp. 94—95.

The high mean number of the 0-group plaice at the south coast of Scania is due to very large numbers caught in 1934 and 1938.

Arvid R. Molander.

Flounder Catches in the Gulf of Gdansk.

An analysis has been carried out of the commercial catches of flounder in the Gulf of Gdansk. From June 1945 to April 1946 age and length determinations were made of several samples of catches from coastal waters and from the Deep of Gdansk. This material permitted us to compare the composition of post-war catches with those from 1937—38 (see the table and Figs. 1 and 2).

The Size Composition (%) in 1945—46 and in 1937—38.

Length cm.	From Coastal Areas		From the Deep of Gdansk	
	1937—38	1945—46	1937—38	1945—46
18	32·1	3·9	5·7	—
19	27·5	8·1	7·0	—
20	15·1	7·1	9·1	1·6
21	8·6	7·0	8·6	2·7
22	6·4	6·3	9·2	7·1
23	2·9	10·8	9·0	10·3
24	1·8	11·1	8·9	15·8
25	1·5	12·4	8·0	14·1
26	0·8	10·7	7·7	12·5
27	0·8	8·6	6·7	6·5
28	0·9	5·7	4·7	5·4
29	0·5	3·1	4·3	4·9
30	0·4	2·2	3·7	6·5
31	0·4	1·1	1·9	6·0
32	0·1	0·8	1·6	2·7
33	0·1	0·4	1·1	1·1
34+	0·2	0·7	2·8	2·7
No. of Fish	3899	719	3394	184
Average Length	19·9 cm.	22·4 cm.	24·3 cm.	26·1 cm.

The comparison shows that the mean length of the flounder is at present greater than in 1937 to 1938, both in the coastal waters and in the Deep of Gdansk. In the coastal catches, the mean length increased from 19·9 to 22·4 cm. and in the Deep of Gdansk from 24·3 to 26·1 cm. As will be seen from Fig. 2, compared with the pre-war period, the IV-group in the catches became far more numerous during 1945—46, while the II and III-groups diminished.

The high percentage of older fish and increased average length seem to indicate that the stock of flounders has recovered during the war years.

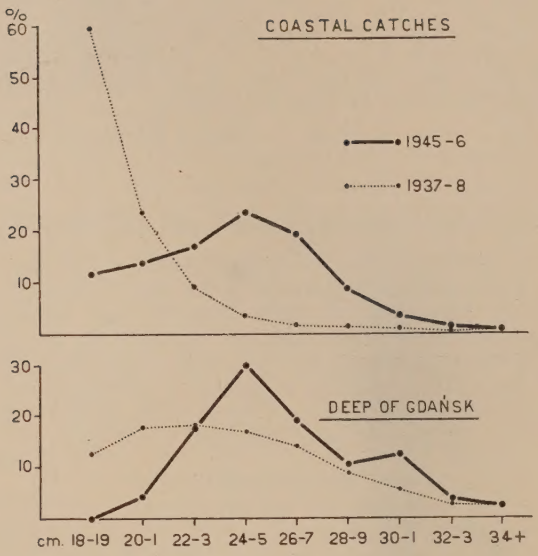


Fig. 1. The Size Composition of the Polish commercial Flounder Catches in 1945—46 and in 1937—38.

In the flounder catches a higher percentage of plaice was found (17·6 %) in 1945—46, about 2 % in 1930—35), and a considerably lower percentage of dab (less than 1 % in 1945—46, 14 % in 1930—35).

Z. Mulicki.

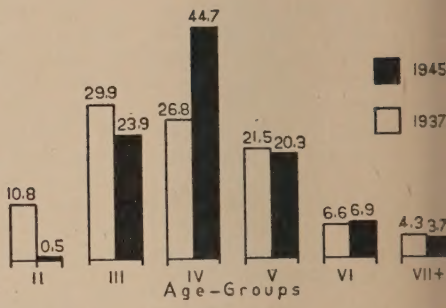


Fig. 2. The Age Composition of the Polish commer Flounder Catches in 1945—46 and in 1937—38.

The Herring at Bornholm.

A Danish trawl fishery for herring was st in the spring of 1946 especially 10—15 mile and NW. of Rønne. A sample from this fi taken on 8. May was examined. In the tables l it has been compared with a sample from ordinary autumn herring fishery with driftnet 2—3 miles NW.of Hasle 2. 10. 1946.

Most of the trawl-caught herring were rec ing spents, while most of the drift-net herring mature or just spent. The racial characters o these herring were those common for the au spawning herring at Bornholm.

Herring.

Table 1. Maturities (%).

Date	Implement	I	II	III	IV	V	VI	VII	VIII
8./5.	Trawl	—	1	5	4	1	4	1	84
2./10.	Drift-net	3	4	9	—	59	5	14	7

Table 2. Racial Characters (number of ind. in brackets).

Date and Implement	Maturities	V.S.	V.P.	K_2	Group
8./5.	I, II, III, IV, V, VI	55·4 (19)	23·3 (19)	13·7 (18)	spring sp.
Trawl	VII, VIII	55·53 (101)	23·94 (101)	14·13 (94)	autumn sp.
2./9.	I, II, III, VIII	55·50 (26)	23·65 (26)	13·7 (18)	spring sp.
Drift-net	V, VI, VII,	55·47 (94)	23·89 (94)	14·13 (52)	autumn sp.

Table 3. Number of Rings on the Scales (%).

Date and Implement	Group	I	II	III	IV	V	VI	VII	VIII	IX	X	Total
9./5.	spring sp.	—	2	5	3	2	—	1	1	- -	—	14
Trawl	autumn sp.	—	2	9	9	9	12	32	12	1	—	86
2./10.	spring sp.	4	6	7	5	—	—	—	—	—	—	21
Drift-net	autumn sp.	1	31	14	13	4	3	8	4	—	1	79

e rest of the fish, the premature and mature
g from the spring, and the premature herring
e recovering spents from the autumn have had
me, or perhaps a somewhat lower, average
r of vertebrae. The number of precaudal
rae and K 2 seems to have been somewhat
No doubt most of these herring were spring
ers.

the whole the spring spawning herring
at Bornholm were younger than the autumn
ng herring. This was particularly the case
the herring caught in the spring, which
ed a considerable number from the rich 1937
938 year-classes (the 9- and 8-ringed respec-
.

ong the spring spawners the 1943 year-class
-ringed) was the most strongly represented.
autumn spawners the 1943 year-class (the
d) was the most frequent in the drift net
s.

om the analyses (Ann. Biol. II, p. 155) it
ound that in 1945 the 2-ringed herring
ated the autumn catches, and it was presumed
l of the herring caught by this fishery were
n spawners. Therefore these 2-ringed herring
ssumed to be 3 years old. Now the findings
enkiewicz concerning the mixture of
spawners and autumns spawners along the
coast, together with the fact that the trawl-
herring at Bornholm included some mature
herefore unquestionable spring spawners,
t that a mixture of spring spawners and
n spawners may exist also in the Bornholm
g fishery. As a matter of fact this is con-
if we analyse the herring caught in the
n of 1945 according to maturity. Then we
he following racial characters:

ities	V. S.	V. P.	K_2
	55·18 (66)	23·41 (66)	13·45 (42)
VII	55·43 (126)	23·93 (126)	14·07 (71)

e low number of V. P. and K 2 suggests that
ally all of these herring of maturity II and
the autumn of 1945 seem to have been
spawners. Most of the 2-ringed herring
ed this group, and therefore the year-class
of the autumn spawners turns out to have
no stronger than the previous year-classes.

Aage J. C. Jensen.

Garfish.

Orphie (*Belone acus* Risso)
La reproduction et le développement.

On a recueilli de nouveaux faits concernant la reproduction et le développement de l'orphie (*Belone acus* Risso) dans les eaux côtières polonaises de la Baltique. Ils font suite aux recherches concernant ce même sujet et dont les résultats ont été publiés dans le Bulletin de la Station Maritime de Hel, No. 2, 1937.

Les lieux de frais de ce poisson se trouvent le long du banc sablonneux Rewa-Kuznica, sur les herbiers sous-marins dans les eaux profondes, de 1—2 m., tièdes et saumâtres.

Le matériel capturé de Juin à Août en 1946 dans le voisinage immédiat du batiment du Laboratoire Maritime de Pêche à Gdynia, nous apporte 83 individus jeunes de cette espèce, de dimensions variant entre 23 et 119 mm. Voici leur liste:

Date	Nombre d'individus	Dimensions en mm.	Taille moyenne en mm.
21.VI.46	63	23—31	25·2
4.VII.46	6	23—28	25·8
4.VII.46	12	40—61	49·5
19.VII.46	1	92	92
5.VIII.46	1	119	119

La présence de ces stades jeunes de l'orphie dans les eaux de Gdynia prouve que le développement de cette espèce méditerrano-boréale se poursuit dans les eaux côtières polonaises de la Baltique, d'où les jeunes s'éloignent vers le large (2 individus de 68 mm. et 76 mm. ont été pêchés dans la région orientale du Golfe de Gdansk près de Brüsterort, le 15.VII.46).

Le développement de l'orphie correspond aux températures du milieu assez élevées (2e moitié de VI 14·6°; 1e moitié de VII 17·8°; 2e moitié de VII 19·7°; 1e moitié de VIII 18·3°) ce qui est évident vu le besoin de maximum d'énergie calorique, indispensable au cours des premiers stades de développement pour cette espèce méridionale. L'orphie est à considérer comme espèce autochtone dans les eaux polonaises de la Baltique, où elle trouve ses lieux de ponte et les jeunes leur pépinière.

K. Demel.